



Exploitation and Marketing Plan for the involvement of partners and future customers - final

D13.7

Authors:

Padraic McKeever (Fraunhofer)	Kalle Kukk (Elering)	Markos Asprou (UCY)
Emmanouil Zoulias (UoA)	Gonçalo Glória (NESTER)	José Pablo Chaves Ávila (Comillas)
Apostolos Kapetanios (ED)	Jukka Rinta-Luomo (FINGRID)	Anastasis Tzoumpas (Ubitech Energy)
Madalena Lacerda (E-REDES)	Daniela Clarke (ČEPS)	Václav Janoušek (CEZ Distribuce)
Ivelina Stoyanova (RWTH)	Nermin Suljanović (EIMV)	Dominik Falkowski (Energia Operator)
Helena Gerard (Vito)	Endika Urresti Padrón (NCBJ)	Martin Chytra (ECD)
Anibal Sanjab (Vito)	Bálint Hartmann (BME)	Luka Nagode (GEN-I)
Vladan Ristić (Energoinfo)	Tamás Bessenyei (MAVIR)	Arslan Ahmad Bashir (Volue Oy)
Ferdinando Bosco (ENG)	Bartosz Kalinowski (TTSA)	Ermis Vasileiou (Ubitech Energy)
Alexandre Lucas (INESC TEC)	Carmen Gutiérrez (IDAE)	Romain Losseau (RTE)
Ákos Baldauf (BME)	Lenos Hadjidemetriou (UCY)	Aleth Barlier (Enedis)
Gábor Péter (EDE)	Ivars Zikmanis (AST)	Beatriz Alonso Santos (i-DE)
Gonçalo Glória (NESTER)	Deividas Šikšnys (Litgrid)	María Hernández Martínez (OMIE)
Boris Turha (EL)	Gytis Nadvaravičius (Litgrid)	Emmanouil Voumvoulakis (HEDNO)
Magda Foti (UBI)	Leon Maruša (EC)	Maite Hormigo Gonzalez (UFD)
Eleni Panagou (UBI)	Vassilis Sakas (ED)	Ioannis Theologitis (ENTSO-E)
Nejc Petrovič (EG)		

Responsible Partner	Fraunhofer
Checked by WP leader	Padraic McKeever (Fraunhofer), 08.03.2024
Verified by the appointed Reviewers	Alessio Coccia (EPRI), 18.03.2024 Siddhesh Gandhi (ENTSO-E), 21.03.2024
Approved by Project Coordinator	Padraic McKeever (Fraunhofer), 25.03.2024

Dissemination Level	Public
----------------------------	--------



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 957739

Issue Record

Planned delivery date	31.03.2024
Actual date of delivery	25.03.2024

Version	Date	Author(s)	Notes
0.1	20230428	Padraic McKeever	Started
0.2	20240308	Authors in table above	Updated continually over past year, ready for review
1.0	20240325	Authors in table above	Updated after reviews

Disclaimer:

All information provided reflects the status of the OneNet project at the time of writing and may be subject to change. All information reflects only the author's view and the European Climate, Infrastructure and Environment Executive Agency (CINEA) is not responsible for any use that may be made of the information contained in this deliverable.





About OneNet

The project OneNet (One Network for Europe) will provide a seamless integration of all the actors in the electricity network across Europe to create the conditions for a synergistic operation that optimizes the overall energy system while creating an open and fair market structure.

OneNet is funded through the EU's eighth Framework Programme Horizon 2020, "TSO – DSO Consumer: Large-scale demonstrations of innovative grid services through demand response, storage and small-scale (RES) generation" and responds to the call "Building a low-carbon, climate resilient future (LC)".

As the electrical grid moves from being a fully centralized to a highly decentralized system, grid operators have to adapt to this changing environment and adjust their current business model to accommodate faster reactions and adaptive flexibility. This is an unprecedented challenge requiring an unprecedented solution. The project brings together a consortium of over seventy partners, including key IT players, leading research institutions and the two most relevant associations for grid operators.

The key elements of the project are:

1. Definition of a common market design for Europe: this means standardized products and key parameters for grid services which aim at the coordination of all actors, from grid operators to customers and service providers;
2. Definition of a Common IT Architecture and Common IT Interfaces: this means not trying to create a single IT platform for all the products but enabling an open architecture of interactions among several platforms so that anybody can join any market across Europe; and
3. Large-scale demonstrators to implement and showcase the scalable solutions developed throughout the project. These demonstrators are organized in four clusters coming to include countries in every region of Europe and testing innovative use cases never validated before.



Table of Contents

1	Introduction	7
1.1	Tasks related to this Deliverable.....	10
1.2	Objectives of the work reported in this Deliverable.....	11
1.3	Outline of the Deliverable.....	12
1.4	How to Read this Document.....	12
2	OneNet Interoperability/ICT Framework Exploitable Results.....	13
2.1	OneNet Framework	13
2.2	OneNet Connector.....	14
2.3	OneNet Decentralised Middleware	15
2.4	OneNet Monitoring and Analytics Dashboard.....	17
2.5	Cross-Platform-Services Catalogue.....	19
2.6	Orchestration Workbench	20
2.7	Reference Data Governance Model.....	21
2.8	Tools for Legal, Regulatory, Privacy and Cybersecurity Compliance	22
3	OneNet Grid Management Solutions Exploitable Results	24
3.1	STAR blockchain Platform.....	26
3.2	OMIE Local market platform (LMP) – Short-term.....	27
3.3	OMIE Local market platform (LMP) – Long-term.....	28
3.4	DSO and TSO Data Exchange Platform (DDEP & TDEP)	30
3.5	TSO Flexibility Needs Evaluation and FSP flexibility provision simulation Tool	31
3.6	Short-Circuit current forecast Tool in TSO-DSO substations	32
3.7	Flexibility Market Platform	33
3.8	Module for automated activations.....	34
3.9	atFlex Flexibility Market Platform.....	35
3.10	Non-frequency ancillary services market platform	37
3.11	F-channel forecasting module	37
3.12	F-channel coordination module.....	40
3.13	Active balancing and congestion management platform (ABCM).....	42
3.14	Multisided platform for residential DER flexibility autotrading.....	43
3.15	TSO-DSO Coordination Platform.....	45
3.16	Optimization-based market clearing module	46
3.17	Flexibility Register	48



3.18	Nord Pool locationally enhanced intraday module	49
3.19	Flexibility Market Platform	50
3.20	DSO Flexibility Needs Evaluation, Sensitivity factor calculation	51
4	Other Exploitable Results	53
4.1	Study on coordination models	53
4.2	Methodology for the estimation of flexibility potential from MV clients	53
4.3	TSO-DSO coordination algorithms	54
4.4	Network traffic light system	55
4.5	TSO-DSO coordination scheme ('traffic light')	57
4.6	FSP accreditation methodology (Flexibility register)	58
4.7	Harmonized market products	58
4.8	Recommendations for Market Designs	59
4.9	Coordinated TSO-DSO Flexibility Market Simulator and Market Clearing Module	61
4.10	OneNet KPIs repository.....	62
4.11	Definition and analysis of Business Models for OneNet BUCs.....	63
4.12	Strategies for customer engagement in the provision of system services	64
4.13	Methodology for market architecture harmonization analysis	65
4.14	Methodology for market phase harmonization analysis	66
4.15	Interoperability Key Document.....	67
4.16	Quantification of BMS' potential	68
4.17	Framework for system services, products and harmonisation of products	68
4.18	Business Use Cases and System Use Cases	70
4.19	Recommendations for the Harmonised Electricity Role Mode	72
4.20	Open Datasets	72
5	Uptake of Solutions by TSOs and DSOs	75
5.1	Uptake by TSOs	75
5.2	Uptake by DSOs	80
6	Conclusions	86
	References	88

List of Abbreviations and Acronyms

Acronym	Meaning
ABCM	Active Balancing Congestion Management
BUC	Business Use Case
DSO	Distribution System Operator
FSP	Flexibility Service Provider
KER	Key Exploitable Result
MO	Market Operator
NA	Not Applicable
SaaS	Software as a Service
SO	System Operator
TRL	Technology Readiness Level
TSO	Transmission System Operator

Executive Summary

The objective of this work is to give stakeholders of the OneNet project insight into OneNet's results and to elaborate and document how the key results will be exploited after the project ends. OneNet's adoption of an open-source approach where possible allows a broad transfer of knowledge, findings, software code and tools to Research and Industry.

OneNet is a large project which has produced many results. The results are presented in three groups. The first group contains results related to the OneNet Framework, which facilitates data exchange to support market and network operations among TSOs and DSOs, as well as stakeholders like prosumers and aggregators. The second group is the OneNet Grid Management Solutions, which are platforms and software related to grid management and flexibility. The third group contains other results.

Basic information about each result is presented, including the prospective market and the exploitation strategy. As OneNet wants to provide open-source software, information about whether software results are open-source is given, along with information on licencing and where the software is available.

The OneNet Framework includes a reference architecture, several software components and a catalogue of harmonised services. OneNet partners have made an application to the Linux Foundation for Energy to have it adopted as a project, which provides a common exploitation path for this group of results.

1 Introduction

This deliverable presents OneNet’s results and how they will be exploited after the project ends.

The main stakeholders who will benefit from OneNet’s results include DSOs, TSOs, Aggregators, FSPs, Market Operators, Balance Responsible Parties, Service Providers, Regulators, (end) Customers, the scientific community, Industry (especially ICT sector, technology providers), EU policy makers, local/regional/national authorities and other public bodies, EU citizen and consumer organisations.

OneNet is applying an open-source approach where possible, with the free transfer of findings, software code and tools. This means that, although there is no obligation on partners to make their software available as open-source, the project has encouraged the partners to adopt open-source. The result of this can be seen in the overview given in Table 1: the OneNet Interoperability/ICT Framework results are open-source and we have applied that they be included as a project in the [Linux Foundation for Energy](#); some of the OneNet Grid Management Solutions results are open-source, but many remain proprietary.

Table 1 **Error! Reference source not found.** gives an overview of all exploitable results and their relevance for the various target groups, which are System Operators (TSOs, DSOs), Market Operators, Standardisation Bodies / Regulators, public bodies and authorities, policy makers, aggregators, consumers (households, businesses, industry), energy communities, citizen and consumer organisations, FSPs¹, researchers and other industry actors. The target group “Research” comprises institutions and universities. The target group “Industry” includes business actors who could serve as providers for hard- or software or as providers for other services e.g. telecommunication services.

The mark x in the table shows when the target group can directly utilize the result for operational or research activities, the mark (x) shows when the target group does not directly utilize the result but benefits indirectly from the usage or implementation.

The results are presented in three groups. The first group contains results related to the OneNet Framework, which facilitates data exchange to support market and network operations among TSOs and DSOs, as well as stakeholders like prosumers and aggregators. The second group is the OneNet Grid Management Solutions, which are platforms and software related to grid management and flexibility. The third group contains other results, which relate more to definition of a common market design for Europe than the definition of a common IT Architecture and common IT Interfaces (largely covered by the results of Ch. 2) or the results related to the OneNet demos (largely covered by the results of Ch 3).

¹ FSP stands for Flexibility Service Provider defined as any entity that offers flexibility services in the market, based on acquired (aggregated) capabilities, usually from third parties.

Table 1: Overview of all Exploitable Results of OneNet, their TRL-levels, open-source status and relevance for the target group

TRLs, open-source & Target Groups → Exploitable Result ↓	TRL start	TRL end	Open Source	SO	MO	Standards Body	Regulator	Public Bodies & Authorities	Policy Makers	Aggregator	Consumer	Energy Communities	Citizen & Consumer Orgs.	FSP	Researcher	Industry
OneNet Interoperability/ICT Framework Exploitable Results																
OneNet Framework	3	8	Yes	x	x					x				x	x	x
OneNet Connector	4	8	Yes	x	x					x				x	x	x
OneNet Decentralised Middleware	3	8	Yes					x							x	x
OneNet Monitoring and Analytics Dashboard	4	8	Yes	x	x						x			x	x	x
Cross-Platform-Services Catalogue	2	8	Yes	x	x					x				x		
Orchestration Workbench	5	7	Yes	x	x									x	x	
Reference Data Governance Model	5	7	NA			x	x	x	x	x	x					x
Tools for Legal, Regulatory, Privacy and Cybersecurity Compliance	4	8	Yes	x	x						x			x	x	x
OneNet Grid Management Solutions Exploitable Results																
STAR blockchain Platform	4	6	Yes	x							x					
OMIE Local market platform (LMP) – Short-term	2	6	No	x	x						x	x		x		x
OMIE Local market platform (LMP) – Long-term	2	6	No	x	x						x	x		x		x
DSO and TSO Data Exchange Platform (DDEP & TDEP)	3	6	No	x												
TSO Flexibility Needs Evaluation and FSP flexibility provision simulation Tool	4	6-7	No	x												
Short-Circuit current forecast Tool in TSO-DSO substations	4	7	No	x												
Flexibility Market Platform	7	9	No	x	x	(x)	(x)		(x)	x	x	x		x	x	
Module for automated activations	6	9	No	x	x	(x)	(x)		(x)	x	x	x	(x)	x		
atFlex Platform	2	7	Yes	x	x					x	x	x	x	x		

TRLs, open-source & Target Groups → Exploitable Result ↓	TRL start	TRL end	Open Source	SO	MO	Standards Body	Regulator	Public Bodies & Authorities	Policy Makers	Aggregator	Consumer	Energy Communities	Citizen & Consumer Orgs.	FSP	Researcher	Industry
Non-frequency ancillary services market platform	1	6	No	x						x						
F-channel forecasting module	3-4	6	Yes	x						x	x	x			x	
F-channel coordination module	3-4	6	Yes	x						x	x	x			x	
ABCM platform	3-4	6-7	No	x												
Multisided platform for Residential DER flexibility autotrading	2-3	5-6	No								x	x	x	x		
TSO-DSO Coordination Platform	6	8	No	x	x									x		
Optimization-based market clearing module	4	7	No	x	x											
Flexibility Register	6/8	8	No	x	x									x		
Nord Pool locationally enhanced intraday module	1	6	No	x										x		
Flexibility Market Platform	4	8	No	x	x					x				x		
DSO Flexibility Needs Evaluation, Sensitivity factor calculation	4	8	No	x						x				x		
Other Exploitable Results																
Study on coordination models	NA	NA	NA	x				x								
Methodology for the estimation of flexibility potential from MV clients	NA	NA	NA							x		x			x	
TSO-DSO coordination algorithms	2	7	No	x	x											
Network traffic light system	5	8	No	x						x						
TSO-DSO coordination scheme ('traffic light')	1	7	NA	x										x		
FSP accreditation methodology (Flexibility register)	1	8	NA	x										x		
Harmonized market products	6	8	NA	x	x									x		
Recommendations for Market Designs	4	7	NA	x	x		x	x	x				x		x	
Coordinated TSO-DSO Flexibility Market	3-4	4-5	No	x	x		x	x	x	x			x	x	x	

TRLs, open-source & Target Groups → Exploitable Result ↓																
	TRL start	TRL end	Open Source	SO	MO	Standards Body	Regulator	Public Bodies & Authorities	Policy Makers	Aggregator	Consumer	Energy Communities	Citizen & Consumer Orgs.	FSP	Researcher	Industry
Simulator and Market Clearing Module																
OneNet KPIs repository	4	8	NA	x											x	x
Definition and analysis of Business Models for OneNet BUCs	2	6	NA	x	x		x	x	x	x	x	x	x	x	x	
Strategies for customer engagement in the provision of system services	4	6	NA	x			x	x		x		x	x		x	
Methodology for market architecture harmonization analysis	4	8	NA	x	x		x	x	x	x	x	x	x	x	x	x
Methodology for market phase harmonization analysis	4	8	NA	x	x		x	x	x	x	x	x	x	x	x	x
Interoperability key document	NA	NA	NA	x	x	x	x	x	x	x	x	x	x	x	x	x
Quantification of BMs potential	6	8	NA	x	x			x	x	x	x	x	x	x	x	x
Framework for system services, products and harmonisation of products	NA	NA	NA	x	x		x		x						x	
Business Use Cases and System Use Cases	NA	NA	NA	x	x		x								x	
Recommendations for the Harmonised Electricity Role Model	NA	NA	NA	x	x		x	x	x						x	
Open Datasets	NA	NA	NA	x											x	

1.1 Tasks related to this Deliverable

This deliverable is strongly related to Task 13.5 “*Preparing long-term adoption of OneNet solutions*” and Task 13.6 “*Exploitation of the results*”. In Task 13.5 the intention is to create close to market-ready products and to involve strategic partners in the preparation of a market rollout. Task 13.6 is concerned with the commercial exploitation and market uptake of the project’s results, resulting in a business plan for each of the exploitable results. In these tasks, the Key Exploitable Results are identified as well as exploitation strategies developed.

1.2 Objectives of the work reported in this Deliverable

The objective of this deliverable is to give stakeholders of the OneNet project insight into OneNet's exploitable results and to elaborate and document how the results will be exploited after the project ends, meaning "to make use and derive benefits- downstream in the value chain of a product, process or solution, or act as an important input to policy, further research or education." [1] Here "result" is defined as "any tangible or intangible output of the action, such as data, knowledge and information whatever their form or nature, whether or not they can be protected, which are generated in the action as well as any attached rights, including intellectual property rights".

The following Technology Readiness Levels (TRLs) are used to characterise the exploitable results' status²:

- TRL 1 – basic principles observed
- TRL 2 – technology concept formulated
- TRL 3 – experimental proof of concept
- TRL 4 – technology validated in lab
- TRL 5 – technology validated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 6 – technology demonstrated in relevant environment (industrially relevant environment in the case of key enabling technologies)
- TRL 7 – system prototype demonstration in operational environment
- TRL 8 – system complete and qualified
- TRL 9 – actual system proven in operational environment (competitive manufacturing in the case of key enabling technologies; or in space)

Exploitation means the utilization of results in further research activities other than those covered by the project, or in developing, creating and marketing a product or process, or in creating and providing a service, or in standardization activities. This means making use of the results; recognizing exploitable results and their stakeholders to concretise the value and impact of the project activity for societal challenges. The exploitation can be commercial, societal, political, or for improving public knowledge and action. The project partners can exploit results themselves or facilitate exploitation by others (e.g. through making results available under open licenses) [2].

This deliverable D13.7 is an update to [D13.6](#) "Exploitation and Marketing Plan for the involvement of partners and future customers-draft", which focussed on identifying the results of the OneNet partners and giving some basic data on them, in particular describing what the result is and what its TRL before and after the

² From https://ec.europa.eu/research/participants/data/ref/h2020/other/wp/2016_2017/annexes/h2020-wp1617-annex-g-trl_en.pdf

project is. Two exploitation workshops have been held since D13.6 was written to elaborate the results and their exploitation.

The results of the projects run as part of the OneNet Open Call with the aim of enhancing OneNet's results with both real demonstration efforts and tools to elevate the OneNet overall framework are documented in D13.6. This set of results has not undergone further development since D13.6, and is therefore omitted in D13.7.

The OneNet partners' individual exploitation plans are also not included in D13.7, as they are confidential. However, information from the system operators (TSOs and DSOs) involved in the project on their plans to implement and scale up the results are included in Ch.5 "Uptake of Solutions by TSOs and DSOs".

1.3 Outline of the Deliverable

Chapters 2-4 describe the individual OneNet exploitable results, in three groups: results related to the OneNet Framework, OneNet Grid Management Solutions, and other results. There are subchapters with detailed description of the result, its target group and why it is of relevance for the target group and the exploitation strategy.

OneNet has 12 TSOs and 17 DSOs as partners. For OneNet's vision of creating *a fully replicable and scalable architecture that enables the whole European electrical system to operate as a single system and in which a variety of markets allows the universal participation of stakeholders regardless of their physical location – at every level from small consumer to large producers* to be realised, it is important that these system operators who have participated in OneNet commit to using the project's results. Statements from each of the TSOs and DSOs are included in Chapter 5.

Chapter 6 sums up the conclusions.

1.4 How to Read this Document

This deliverable is a standalone and closed document, which has in no special relation to other deliverables.

2 OneNet Interoperability/ICT Framework Exploitable

Results

2.1 OneNet Framework

Name:	OneNet Framework
Description	The OneNet Framework is a decentralised ecosystem for interoperability and data exchange. In the OneNet Framework, two systems (OneNet Participants) can exchange their own data directly each other, without intermediation by a third party. Any kind of energy stakeholder can participate in the OneNet Data Space using the OneNet Decentralised Middleware and the OneNet Connector. In addition, the OneNet Framework offers additional platforms for service orchestration (OneNet Orchestration Workbench) and for monitoring and analytics (OneNet Monitoring and Analytics Dashboard) in order to facilitate the services integration and stakeholder cooperation.
Responsible Partner	ED, ENG, UBE
Type	Software, Methodology.
Main Impact Domain	Commercial
Innovativeness introduced compared to already existing Products/Services	<ul style="list-style-type: none"> Fully enabled data space solution Modular architecture with core components (Connector and Middleware) plus additional supporting platforms
Unique Selling Point USP - Unique Value Proposition UVP	The OneNet Framework is fully integrated with the Data Space technology enablers, offering a complete solution ready-to-go for creating and/or participating in an Energy Data Space
"Market" – Customers	Major stakeholders of the Electricity domain (including TSO/DSOs, Aggregators, FSPs, Market Operators)
"Market" - Solution already on the market	None
Open Source (yes/no)	Yes
Licencing	Mixed License (see platforms' licenses)
Access and Support	The OneNet Framework is released as open source and modular architecture. It is possible to install the entire framework or a single platform. OneNet Middleware is mandatory for implementing a data space instance. OneNet Connectors can be installed locally in each platform environment. Additional platforms and tools are optional. Detailed description for installation is provided together with code release.
Exploitation Strategy	<p>The OneNet Framework, and all its part, will be released as open source and submitted as open project in the Linux Foundation for Energy (LFE).</p> <p>LFE provides a strong community for build and evolve energy projects, ensuring the maintenance and the evolution of the software in structured way.</p> <p>This will ensure a follow-up activity after the project for exploiting and improve the solution.</p> <p>In addition, the single part of the OneNet Framework (see chapters below) can be exploited separately from different partners involved.</p>

	<p>The NOCL partners Fingrid and Volue Oy will commercially exploit OneNet flexibility market concept. In Finland, National TSO Fingrid is setting up a local flexibility market with a few DSOs experiencing congestions due to increased electrification of heating sector. This initiative regarding local flexibility market pilot in Finland is planned to go live in on 1st of October 2024. Volue Oy is acting as a consultant. The competencies of different marketplaces will be examined in relation to the features presented in the OneNet framework, such as TSO-DSO coordination, common registry mechanism, verification and settlement etc.</p> <p>Several Horizon projects will use and expand the OneNet Framework, e.g. TwinEU, EDDIE, INTERSTORE, ENERSHARE, RESONANCE.</p>
TRL before the project	3
TRL after the project	8
TRL required by GA	8 (developing and implementing the OneNet architecture with a TRL of minimally 8)

2.2 OneNet Connector

Name:	OneNet Connector
Description	<p>OneNet Connector is a plug-and-play solution to be placed inside any already existing platform for allowing an easy integration and cooperation among the platforms, focusing mainly on P2P data exchanges maintaining the data ownership and preserving access to the data sources.</p> <p>The OneNet Connector, based on TRUE Connector, combines the International Data Spaces principles with the advantages of the FIWARE ecosystem ensuring a seamless and secure data exchange in a completely end-to-end, domain-agnostic decentralized approach.</p> <p>The OneNet Connector is a software component which can be downloaded from: https://github.com/european-dynamics-rnd/OneNet</p> <p>The OneNet Connector can easily be deployed and integrated with any platform through a comprehensible REST API interface. It offers a clear, user-friendly functionality (both through the REST API and/or the GUI) enabling users and platforms to exchange data. In addition, the OneNet Connector offers a pre-defined, dynamically evolving list of Cross Platform Services Catalogue, with Business Objects and corresponding Data Profiles providing to the whole system semantic and data interoperability.</p> <p>See also OneNet D6.8 “OneNet Framework and Components Final Release”.</p>
Responsible Partner	ED, ENG
Type	Software
Main Impact Domain	Commercial
Innovativeness introduced compared to already existing Products/Services	<ul style="list-style-type: none"> • IDSA RAM Compliance • FIWARE Integration • Enables interoperability among all domain stakeholders • Cross-domain interoperability

	<ul style="list-style-type: none"> Decentralization
Unique Selling Point USP - Unique Value Proposition UVP	Expands the possibility of transactions with “external” platforms and services with low effort
"Market" – Customers	Major stakeholders of the Electricity domain (including TSO/DSOs, Aggregators, FSPs, Market Operators)
"Market" - Solution already on the market	Limited IT systems with islanding operation in terms of flexibility services.
Open Source (yes/no)	Yes
Licencing	GNU AGPL v3.0
Access and Support	<p>The OneNet Connector can be downloaded from: https://github.com/european-dynamics-rnd/OneNet</p> <p>Supported by European Dynamics and Engineering, who will continue to maintain it beyond the project. The GitHub functionalities (branching, documenting issues etc.) can be used for interested parties to contact the initial developers or to promote new developments or additions on the OneNet connector. Contact details as indicated in the GitHub repository.</p>
Exploitation Strategy	<p>The OneNet Connector, as part of the OneNet Framework, will be released as open source and submitted as open project in the Linux Foundation for Energy (LFE).</p> <p>LFE provides a strong community to build and evolve energy projects, ensuring the maintenance and the evolution of the software in structured way.</p> <p>This will ensure a follow-up activity after the project for exploiting and improve the solution, giving the possibility to create new tools and services based on that with a more mature status.</p> <p>In addition, market access through the provision of IT services and/or IT systems integration for major stakeholders (i.e. TSO/DSO) or federated organisations can be provided by ED and/or ENG as principal developer of the software.</p> <p>Time to Market 1-3 years</p>
TRL before the project	4
TRL after the project	8
TRL required by GA	8

2.3 OneNet Decentralised Middleware

Name:	OneNet Decentralised Middleware
Description	The OneNet Decentralized Middleware is the core component of the OneNet system. It is implemented using a decentralized approach based on the more used and promising standard architecture and interfaces, namely IDS and FIWARE. It allows the integration and collaboration of the OneNet participants,

	<p>facilitating the cross-platform market and network operations, ensuring scalability and interoperability, while maintaining the data ownership.</p> <p>OneNet Decentralized Middleware and OneNet Connector are strictly linked. The Decentralized Middleware is the middleware that enables the identification of Connectors as well the creation of services and catalogues. The Connector enables the data exchange in an end-to-end way; thus the Connector can be perceived as the entry point for Energy stakeholders for enabling the central administration features and then enabling a completely decentralized end-to-end data exchange.</p>
Responsible Partner	European Dynamics
Type	Software
Main Impact Domain	Commercial
Innovativeness introduced compared to already existing Products/Services	<ul style="list-style-type: none"> - IDSA RAM Compliance - FIWARE Integration - Management of Meta-Data - Management of Cross-Platform-Services - Management of Business Objects (Ontologies & Data Types) - Clearing House functionality
Unique Selling Point USP - Unique Value Proposition UVP	Orchestrates the coordination between the OneNet participants. Harmonizes communication
"Market" – Customers	<p>The OneNet decentralized Middleware directly serves the users of the OneNet Connector, e.g. major stakeholders of the Electricity domain (including TSO/DSOs, Aggregators, FSPs, Market Operators).</p> <p>However, it requires to be controlled by a kind of a “supervising” authority of an OneNet-based pool of participants, since this Middleware provides for orchestration (e.g. authorization, harmonization, clearing house services) and as such can be targeted as well to Industry Associations, Regulatory Authorities or similar.</p>
"Market" - Solution already on the market	None
Open Source (yes/no)	Yes
Licencing	GNU AGPL v3.0
Access and Support	<p>The Tool is embedded currently in the OneNet Connector/Decentralized Middleware as a separate module (see Ch. 2.1 “OneNet Framework” above). The OneNet Connector is a software component which can be downloaded from: https://github.com/european-dynamics-rnd/OneNet</p> <p>Supported by European Dynamics and Engineering who will maintain it beyond the project.</p> <p>The GitHub functionalities (branching, documenting issues etc.) can be used for interested parties to contact the initial developers or to promote new developments or additions on the OneNet connector.</p> <p>Contact details as indicated in the GitHub repository.</p>
Exploitation Strategy	<p>Market access through the provision of IT services and/or IT systems integration for major stakeholders (i.e. TSO/DSO) or federated organisations by ED and/or ENG</p> <ul style="list-style-type: none"> • New product/service • Licensing agreement (through open license)

	Time to Market 1-3 years
TRL before the project	TRL3
TRL after the project	TRL8
TRL required by GA	TRL8

2.4 OneNet Monitoring and Analytics Dashboard

Name:	OneNet Monitoring and Analytics Dashboard
Description	<p>The OneNet Monitoring and Analytics Dashboard constitutes the front end of the tools responsible for performing network traffic monitoring, analysis and classification within the OneNet Decentralized Middleware. The cornerstone of its functionality is security through analytics. This involves collecting and analyzing log data, enabling the usage of queries to display various insights, which in turn facilitates informed decision-making related to cybersecurity. Core features include a data analytics dashboard that displays various information regarding connector usage arranged in a number of charts. Charts depict data such as number of requests per country, number of requests per day, live monitoring of requests, data sent over time and response codes over time. Another feature of the dashboard is anomaly detection, which allows dashboard users to monitor the activity of potentially malicious clients detected by an anomaly detection machine learning model. The dashboard also offers the ability to generate a security report based on the results of the anomaly detection algorithm and to use the advanced filtering tool to query any connector logs which fulfil certain criteria. Finally, it provides alerting functionality as well as administrative and configuration tools for OneNet participants through the account management page.</p> <p>https://dashboard-eu-onenet.euprojects.net/auth/login</p>
Responsible Partner	Ubitech Energy
Type	Software
Main Impact Domain	Commercial
Innovativeness introduced compared to already existing Products/Services	<ul style="list-style-type: none"> • Easily integrated with data spaces solutions like the OneNet Connector • Integrated with the Identity and Access Manager used in the OneNet Middleware, allowing a unified authentication process. • Leverages machine learning for network traffic classification.
Unique Selling Point USP - Unique Value Proposition UVP	Ready-to-go, dockerized network monitoring and analytics web platform deeply integrated with data space implementations.
"Market" – Customers	<ul style="list-style-type: none"> • Service Providers

	<ul style="list-style-type: none"> • Energy Stakeholders (SOs, Market Operators, FSPs) • Researchers
"Market" - Solution already on the market	The usage of machine learning for network traffic classification is common but we are not aware of any network monitoring and analytics solutions achieving integration with data space connectors and particularly the OneNet connector.
Open Source (yes/no)	Yes
Licencing	MIT
Access and Support	<p>The software is open-source and it may be downloaded through the following Github repository: https://github.com/ubitech/onetnet-dashboard-deployment</p> <p>Ubitech Energy (UBE) is currently responsible for the development and distribution of the software. If the tool becomes commercially used beyond the end of the project, Ubitech Energy will maintain the repositories, respond to issues and discussions. The developers may be contacted at: epanagou@ubitech.eu, kmylonas@ubitech.eu, mfoti@ubitech.eu. Furthermore, they may be contacted through the Github platform where the source code of the software resides by creating issues in the respective repository. Technical support will be provided to users and developers contributing to the software. The documentation of the software is included within the aforementioned repository in the form of Markdown files. Github Discussions will be used as a platform for exchanging ideas related to the project. The solution is already and will be applied to future research and development projects. We will also attempt to trigger contributions from the online open-source community of Linux Foundation Energy (LFE).</p>
Exploitation Strategy	<ul style="list-style-type: none"> • Market access through the provision of IT services and/or IT systems integration for major stakeholders (i.e. TSO/DSO) or federated organisations by Ubitech Energy • New product/service • Channel to reach the identified customers: <ul style="list-style-type: none"> ○ Existing B2B collaborations ○ Conferences and events ○ Online presence ○ Industry associations and partnerships • Licensing agreement (through open license) <p>Time to Market 1-3 years</p>
TRL before the project	4
TRL after the project	8
TRL required by GA	8

2.5 Cross-Platform-Services Catalogue

Name:	Cross-Platform-Services Catalogue
Description	<p>A tool that implements the methodology developed within OneNet project to define and describe Cross-Platform-Services in the electricity domain with their underlying Business Objects, enabling the harmonised data exchange between different platforms and actors.</p> <p>The Tool is embedded currently in the OneNet Connector/Decentralized Middleware as a separate module (see Ch. 2.1 above). The OneNet Connector is a software component which can be downloaded from: https://github.com/european-dynamics-rnd/OneNet.</p>
Responsible Partner	ED, ENG
Type	Software
Main Impact Domain	Policy, Commercial
Innovativeness introduced compared to already existing Products/Services	<ul style="list-style-type: none"> • Harmonized structure • Cross-platform services definition & management • Platform independent • Integration with the OneNet Connector • Open Architecture
Unique Selling Point USP - Unique Value Proposition UVP	Simplification of process, data and effort for cross-platform communication and management of cross-platform services.
"Market" – Customers	Major stakeholders of the Electricity domain (including TSO/DSOs, Aggregators, FSPs, Market Operators)
"Market" - Solution already on the market	Limited IT systems with islanding operation in terms of flexibility services.
Open Source (yes/no)	Yes
Licencing	GNU AGPL v3.0
Access and Support	<p>Accessible on GitHub (see link above in “Description”). Supported by European Dynamics and Engineering who will maintain it beyond the project.</p> <p>The GitHub functionalities (branching, documenting issues etc.) can be used for interested parties to contact the initial developers or to promote new developments or additions on the OneNet connector. Contact details as indicated in the GitHub repository.</p>
Exploitation Strategy	<p>Market access through the provision of IT services and/or IT systems integration for major stakeholders (i.e. TSO/DSO) or federated organisations.</p> <ul style="list-style-type: none"> • New product/service • Updates through follow-up projects • Licensing agreement (through open license and community building)

TRL before the project	2
TRL after the project	8
TRL required by GA	6-8 (Innovation Pillar 2: "Moving from system-centric to consumer-centric approach", Product design for system services)

2.6 Orchestration Workbench

Name:	Orchestration Workbench
Description	<p>OneNet Orchestration Workbench is a software component able to orchestrate and evaluate the performance and scalability of the cross-platform services that will be integrated and implemented in the OneNet System.</p> <p>Any OneNet participant is able to test and evaluate its own service exploiting the OneNet Orchestration Workbench, that allows to integrate data coming from the OneNet Connector and to implement a data pipeline orchestration.</p> <p>A test environment of the OneNet Orchestration Workbench is available on ENG cloud environment at the following URL: http://smart-energy.eng.it.</p>
Responsible Partner	ENG
Type	Software
Main Impact Domain	Commercial
Innovativeness introduced compared to already existing Products/Services	Microservices orchestration platform, integrated with the Energy Data Space concept enabled from OneNet project.
Unique Selling Point USP - Unique Value Proposition UVP	Simplification of process, data and effort for cross-platform communication
"Market" – Customers	Service Provider, Energy Stakeholder (SOs, Market Operators, FSPs), Researchers
"Market" - Solution already on the market	Already existing solution are not integrated with the concept of Data Space and its related technologies (e.g, the Data Connector)
Open Source (yes/no)	Yes
Licencing	MIT
Access and Support	<p>The Orchestration Workbench is released as open source and includes three main components:</p> <ul style="list-style-type: none"> • Web Dashboard • Rancher v2.0 • SOGNO LFE <p>A complete documentation for configuring and installing the Orchestration Workbench is provided in OneNet D6.4 – AI, Big Data, IoT Orchestration Workbench.</p> <p>The maintenance of the software is supported by ENG.</p>

Exploitation Strategy	The solution is partially based on the LFE Open source SOGNO Platform. The Orchestration Workbench will be released with an open-source license too. ENG plans to maintain as its own internal solution and offer to the user in a Platform-as-a-service model. New product/service
TRL before the project	5
TRL after the project	7
TRL required by GA	6-8 (Integrated and interoperable data and platform architecture)

2.7 Reference Data Governance Model

Name:	Reference Data Governance Model
Description	The Reference Data Governance Model (based on literature review, OneNet data exchange framework and survey results) consists of a number of governance elements and requirements. It complements the European Data Exchange Reference Architecture proposed by BRIDGE Initiative. It is reported in OneNet Deliverable 6.2 .
Responsible Partner	Elering
Type	Other
Main Impact Domain	Policy
Innovativeness introduced compared to already existing Products/Services	Reference Data Governance Model is expected to contribute to European data exchange interoperability. Actions have been already taken through the channels like BRIDGE Initiative's Data Management Working Group, Expert Group 1 of Smart Grids Task Force (dealing with data interoperability implementing acts), relevant groups of ENTSO-E.
Unique Selling Point USP - Unique Value Proposition UVP	It supports European wide cross-border and cross-sector data exchange interoperability. Governance is the key for European common data spaces.
"Market" – Customers	<ol style="list-style-type: none"> 1. EU and national policy makers and regulators 2. ICT sector 3. Data intermediaries 4. Data providers and consumers 5. Standardisation bodies
"Market" - Solution already on the market	Some other European initiatives are working towards common data space, e.g. GAIA-X, IDSA, OPEN DEI, Horizon Europe projects. The Reference Data Governance Model proposed by OneNet intends to focus on and complement other initiatives with governance aspects in a comprehensive manner.
Open Source (yes/no)	NA
Exploitation Strategy	The policy makers and stakeholders will be reached through contribution in initiatives like BRIDGE and Smart Grid Task Force. Also, ENTSO-E and EU DSO Entity are expected to promote the results.

	Reference Data Governance Model is intended to be the additional layer to BRIDGE Initiative's Data Exchange Reference Architecture (DERA) and as such contribute to Common Energy Data Space discussions and developments.
TRL before the project	5
TRL after the project	7
TRL required by GA	Not explicitly mentioned in GA

2.8 Tools for Legal, Regulatory, Privacy and Cybersecurity Compliance

Name:	Tools for Legal, Regulatory, Privacy and Cybersecurity Compliance
Description	The legal, regulatory, privacy and cybersecurity compliance tools provide continuous monitoring of the source traffic logs that come through the system under consideration, to assist on the cyber-security preservation aspects. Malicious network activity and system vulnerabilities can be identified and used for the update and enhancement of the data access policies. Also, these tools are responsible for network traffic classification or clustering based on the Isolation Forest machine learning algorithm. The algorithm extracts useful features around the data traffic such as basic features (source/destination IP address, source/destination host port, frame length), time-based features (number of frames received in a specific time interval), connection-based features (number of packets flowing from source to destination and vice versa) and performs classification of traffic as normal or abnormal. https://dashboard-eu-onenet.euprojects.net/auth/login
Responsible Partner	Ubitech Energy
Type	Software
Main Impact Domain	Commercial
Innovativeness introduced compared to already existing Products/Services	<ul style="list-style-type: none"> Easily integrated with data spaces solutions like the OneNet Connector Integrated with the Identity and Access Manager used in the OneNet Middleware, allowing a unified authentication process. Leverages machine learning for network traffic classification.
Unique Selling Point USP - Unique Value Proposition UVP	Ready-to-go, dockerized network monitoring and analytics web platform deeply integrated with data space implementations.
"Market" – Customers	<ul style="list-style-type: none"> Service Providers Energy Stakeholders (SOs, Market Operators, FSPs) Researchers
"Market" - Solution already on the market	The usage of machine learning for network traffic classification is common but we are not aware of any network monitoring and analytics solutions achieving integration with data space connectors and particularly the OneNet connector.
Open Source (yes/no)	Yes
Licencing	MIT
Access and Support	The software is open-source and it may be downloaded through the following Github repository:

	<p>https://github.com/ubitech/onenet-dashboard-deployment</p> <p>Ubitech Energy (UBE) is currently responsible for the development and distribution of the software. If the tool becomes commercially used beyond the end of the project, Ubitech Energy will maintain the repositories, respond to issues and discussions. The developers may be contacted at: epanagou@ubitech.eu, kmylonas@ubitech.eu, mfoti@ubitech.eu. Furthermore, they may be contacted through the Github platform where the source code of the software resides by creating issues in the respective repository. Technical support will be provided to users and developers contributing to the software. The documentation of the software is included within the aforementioned repository in the form of Markdown files. Github Discussions will be used as a platform for exchanging ideas related to the project. The solution is already and will be applied to future research and development projects. We will also attempt to trigger contributions from the online open-source community of Linux Foundation Energy (LFE).</p>
Exploitation Strategy	<ul style="list-style-type: none"> • Market access through the provision of IT services and/or IT systems integration for major stakeholders (i.e. TSO/DSO) or federated organisations by Ubitech Energy • New product/service • Channel to reach the identified customers: <ul style="list-style-type: none"> ○ Existing B2B collaborations ○ Conferences and events ○ Online presence ○ Industry associations and partnerships • Licensing agreement (through open license) <p>Time to Market 1-3 years</p>
TRL before the project	4
TRL after the project	8
TRL required by GA	8 (developing and implementing the OneNet architecture with a TRL of minimally 8)

3 OneNet Grid Management Solutions Exploitable Results

The following table gives an overview of the OneNet Grid Management Solutions and the demos where they were developed.

	Grid Monitoring	Management of grid congestion	Grid operation	Network Planning	Flexibility Management	Forecasting
French Demo	STAR blockchain Platform					
Spanish Demo		OMIE Local market platform (LMP) – Short-term				
		OMIE Local market platform (LMP) – Long-term				
Portuguese Demo			DSO and TSO Data Exchange Platform (DDEP & TDEP)	Short-Circuit current forecast Tool in TSO-DSO substations		
			TSO Flexibility Needs Evaluation and FSP flexibility provision simulation Tool			
Slovenian Demo		Flexibility market platform			Module for automated activations	
Polish Demo					atFlex Platform	
Czech Demo					Non-frequency ancillary services market platform	
Greek Demo					F-channel coordination module	F-channel forecasting module

Cyprus Demo		ABCM platform			ABCM platform	
Northern Cluster					TSO-DSO Coordination Platform	
					Optimization-based market clearing module	
					Flexibility Register	
					Multisided platform for Residential DER flexibility autotrading	
					Nord Pool locationally enhanced intraday module	
Hungarian Demo		Flexibility market platform	DSO Flexibility Needs Evaluation, Sensitivity factor calculation			



3.1 STAR blockchain Platform

Name:	STAR blockchain Platform
Description	<p>STAR is a platform that allows sharing information needed for the producers' compensation following a flexibility activation, but not directly undertaking it. It aims to build a shared ledger, through blockchain technology, to simplify and optimize the management of renewable production curtailments by covering the entire life cycle of a flexibility offer, from the order emission to the compensation of the curtailment.</p> <p>The TSO, DSO and producers can access the STAR platform. All monitored data (Curtailment orders, Energy amount, Metering data, Unit prices,...) are tracked on Star Platform.</p> <p>See OneNet D9.4 deliverable – Validation & result of concept test – France and D9.7 – Validation & results of Concept Test - France)</p>
Responsible Partner	RTE, Enedis
Type	Software
Main Impact Domain	Curtailment order management
Innovativeness introduced compared to already existing Products/Services	<p>Blockchain technology:</p> <ul style="list-style-type: none"> • Technology is more complex than conventional technology • Transparency between actors' improvement and enhanced user's experience • Reducing the risk of disputes by ensuring technically a unique immutable data • Enabling possible future use of smart contracts applying to producers' compensation
Unique Selling Point USP - Unique Value Proposition UVP	The added value of this demonstration is for TSO, DSO, and producer with the set-up of a new process of compensation of curtailment activation.
"Market" – Customers	TSO, DSO, Producer
"Market" - Solution already on the market	A priori no solution already existing that uses open permissioned blockchain technologies.
Open Source (yes/no)	yes, available at https://github.com/rte-france/star There is a public README with deployment instructions.
Licensing	Licence type: Apache 2.0
Access and Support	<p>Only accessible by involved participants until the end of the experiment</p> <p>As the STAR platform will not be continued after the experiment, no technical support will be provided after OneNet ends. There will be no further development, the data model will be reused though.</p>
Exploitation Strategy	New Technology (blockchain)

	<p>The compensation process for curtailment process will be industrialized. The technology used will be defined at the end of the demonstration depending on the demo's result.</p> <p>STAR platform is only running in the experimental phase and will not be industrialised. The defined data model will be reusable though</p>
TRL before the project	TRL4 – technology (blockchain in our use case) validated in lab
TRL after the project	TRL6 – technology (blockchain on our use case) validated or not in relevant environment (industrially relevant environment in case of key enabling technologies)
TRL required by GA	6 : the use case is a demonstration on real flexibilities activations and not a simple validation

3.2 OMIE Local market platform (LMP) – Short-term

Name:	OMIE Local market platform (LMP) – Short-term
Description	The short-term local market platform is the system responsible for receiving the unexpected or short-term programmed DSO needs on market sessions for flexibility procurement, the bids from FSPs, the market clearing and for the communication of short-term market results to different stakeholders. It is further described in OneNet deliverable D9.3 Validation and results of concept test - Spain and in D5.1: OneNet Concept and Requirements , Chapter 10.3.2 Spanish demo SUC, Local Platform.
Responsible Partner	OMIE
Type	Software
Main Impact Domain	Technical and societal
Innovativeness introduced compared to already existing Products/Services	Applies the EC Directive 944/2019 Article 32 – “Incentives for the use of flexibility in distribution networks”
Unique Selling Point USP - Unique Value Proposition UVP	The platform will allow: (i) DSOs to request flexibility to manage day ahead or intraday congestion problems, and (ii) consumers to maximize the economic performance of the DERs at its disposal (e.g. PV, batteries, etc.).
"Market" – Customers	<ul style="list-style-type: none"> • DSO • FSPs / Market agents with DERs • Aggregators • Electric Vehicle • Energy Communities • Demand Response (industrial, residential, final active consumers...) • Storage owners • Distributed generators
"Market" - Solution already on the market	NA (lack of regulation)

Open Source (yes/no)	No
Licencing	Non applicable as it's a closed-source platform
Access and support	<p>Access: OMIE provided an electronic certificate to the demo participants to access the short-term local market platform. The certificates are created by own PKI (Public Key Infrastructure).</p> <p>Support: OMIE provided a user manual to facilitate the access to the platform to demos participant.</p>
Exploitation Strategy	<p>To promote new policy recommendation to integrate a new local flexibility market in Spain.</p> <p>Channel to reach the identified customers:</p> <ul style="list-style-type: none"> Spanish electricity market regulation. This objective could be reached through the participation of OMIE and other stakeholders in sandbox projects, among other initiatives. <p>Resources needed for going to the market:</p> <ul style="list-style-type: none"> Spanish electricity market regulation <p>Target: Flexible resources capable of responding DSOs needs.</p> <p>Exploitation after the project's demonstration and testing: we'll continue improving the platform with the feedback of the relevant stakeholders by participating in other innovation projects and sandboxes until the final transposition of EU directives in Spain.</p>
TRL before the project	2
TRL after the project	6
TRL required by GA	demonstrating OneNet Innovation pillars to TRL minimally from level 6 to 8 validated through field trials

3.3 OMIE Local market platform (LMP) – Long-term

Name:	OMIE Local market platform (LMP) – Long-term
Description	The long-term local market platform is the system responsible for receiving the future DSO scheduled needs on market sessions for flexibility procurement, the bids from FSPs, the market clearing and for the communication of long-term market results to different stakeholders. It is further described in OneNet deliverable D9.3 Validation and results of concept test - Spain .
Responsible Partner	OMIE
Type	Software
Main Impact Domain	Technical and societal
Innovativeness introduced compared to	Applies the EC Directive 944/2019 Article 32 — “Incentives for the use of flexibility in distribution networks”

already existing Products/Services	
Unique Selling Point USP - Unique Value Proposition UVP	The platform will allow: (i) DSOs to request flexibility to manage congestions in the long term with the DERs connected to it, avoiding in some cases investments in network expansion, and (ii) consumers flexibility registration and to maximize the economic performance of the DERs at its disposal (e.g. PV, batteries, etc.).
"Market" – Customers	<ul style="list-style-type: none"> • DSO • FSPs / Market agents with Ders • Aggregators • Electric Vehicle • Energy Communities • Demand Response (industrial, residential, final active consumers...) • Storage owners • Distributed generators
"Market" - Solution already on the market	NA (lack of regulation)
Open Source (yes/no)	No
Licencing	Non applicable as it's a closed-source platform
Access and support	<p>Access: OMIE provided a user/password to the demo participants to access the long-term local market platform.</p> <p>Support: OMIE provided a user manual to facilitate the access to the platform to demos participant.</p>
Exploitation Strategy	<p>To promote new policy recommendation to integrate a new local flexibility market in Spain.</p> <p>Channel to reach the identified customers:</p> <ul style="list-style-type: none"> • Spanish electricity market regulation. This objective could be reached through the participation of OMIE and other stakeholders in sandbox projects, among other initiatives. <p>Resources needed for going to the market:</p> <ul style="list-style-type: none"> • Spanish electricity market regulation <p>Target: Flexible resources capable of responding DSOs needs.</p> <p>Exploitation after the project's demonstration and testing: we'll continue improving the platform with the feedback of the relevant stakeholders by participating in other innovation projects and sandboxes until the final transposition of EU directives in Spain.</p>
TRL before the project	2
TRL after the project	6
TRL required by GA	demonstrating OneNet Innovation pillars to TRL minimally from level 6 to 8 validated through field trials

3.4 DSO and TSO Data Exchange Platform (DDEP & TDEP)

Name:	DSO and TSO Data Exchange Platform (DDEP & TDEP)
Description	<p>Cloud system that will serve as a gateway between the internal systems of the DSO and the TSO with other possible external entities. This cloud system serves the necessary IT infrastructure (e.g. servers and databases) to deploy the developed software components, thus being capable of fulfilling the use cases and required APIs, through modules and information exchange mechanisms within a cloud environment. The DDEP relies on Azure cloud services, while TDEP is deployed on an AWS cloud service.</p> <p>Each system is separated in two main layers: communication (API Middleware and Developer Portal) and operational (flexibility module, operational module and data storage).</p>
Responsible Partner	E-REDES (DDEP) and NESTER (TDEP)
Type	Software
Main Impact Domain	Technical
Innovativeness introduced compared to already existing Products/Services	It will allow a seamless information exchange between DSOs and TSOs, closer to real-time operation of the system.
Unique Selling Point USP - Unique Value Proposition UVP	Increased efficiency in the management and operation of the grid, and a more efficient use of the flexible resources.
"Market" – Customers	DSOs, TSOs
"Market" - Solution already on the market	The use of API based solutions are common and thoroughly used to other purpose data exchange. For the interactions between the DSO and TSO for operational planning purposes, the exchange is essentially done through e-mail or SFTP, with lower frequency and scope of data, so the use of APIs for this purpose and under these characteristics is still not a fully deployed and marketed solution.
Open Source (yes/no)	No. The platform itself won't, but as mentioned below majority of the source code will be.
Licencing	Closed source
Access and Support	Not applicable, since the DEPs will not be open source, there will be no support to its use externally to the demo partners.
Exploitation Strategy	<p>To serve as best practice/technology transfer for other SOs.</p> <p>Both the architecture and the APIs specification, API documentation in swagger in both YAML and JSON formats and data model are published in the deliverable D9.2, allowing a replication to other realities. As for exploitation, after the demonstration and testing, its use in the daily activities of the DSO and TSO will be assessed together other internal teams from the companies. Present a proof-of-concept to the internal teams so that they can define a plan for the exploitation of the DEPs and further increase the TRL.</p>

	After the testing of the solution (End of 2023) within the Portuguese demonstration, its use and roll-out for daily use by the system operators will be assessed, so at this stage, no specific time to market has been defined.
TRL before the project	3
TRL after the project	6
TRL required by GA	demonstrating OneNet Innovation pillars to TRL minimally from level 6 to 8 validated through field trials

3.5 TSO Flexibility Needs Evaluation and FSP flexibility provision simulation Tool

Name:	TSO Flexibility Needs Evaluation and FSP flexibility provision simulation Tool
Description	The tool is composed of 2 modules: one that computes the TSO nodal flexibility needs in the TSO/DSO transformers (EHV/HV) and another that provides the FSPs with optimal dispatch to solve the TSO flexibility needs. The tool can be used for single or multi-period studies and can run a stochastic analysis.
Responsible Partner	R&D NESTER
Type	Software
Innovativeness introduced compared to already existing Products/Services	The stochastic multi-period OPF framework included in the tool is an innovative solution, that allows the TSOs to identify the grid flexibility needs profile, taking into consideration different levels of demand uncertainty as input.
Unique Selling Point USP - Unique Value Proposition UVP	In the OneNet deliverables 9.2 and 9.5 , the tool is presented as well as the methodology behind it. For now, the tool will not be provided (delivered, experienced or acquired) publicly. However, the Portuguese TSO (REN) will test it and try to integrate it in their usual operational planning procedures (if the testing phase is successful).
"Market" – Customers	TSOs
"Market" - Solution already on the market	NA
Open Source (yes/no)	No
Licencing	Closed-Source
Exploitation Strategy	<p>New Product/Service and technology transfer.</p> <p>In the OneNet deliverables 9.2 and 9.5, the tool is presented as well as the methodology behind it. The goal is also to build on top of this tool some new features that can fit in some future EC calls scope. When it reaches a stage of maturity ready for market deployment the commercialization as SaaS is one hypothesis under analysis.</p> <p>For now the tool will not be provided (delivered, experienced or acquired) publicly. However the Portuguese TSO (REN) and DSO (E-REDES) will test it and</p>

	try to integrate it in their usual operational planning procedures (if the testing phase is successful). It can be used as basis to be improved in future EC projects and replicable in other realities.
Status of IPR	Working on an application for patent
TRL before the project	4
TRL after the project	6-7
TRL required by GA	demonstrating OneNet Innovation pillars to TRL minimally from level 6 to 8 validated through field trials.

3.6 Short-Circuit current forecast Tool in TSO-DSO substations

Name:	Short-Circuit current forecast Tool in TSO-DSO substations
Description	The tool computes day-ahead three-phase short-circuit levels for the 63kV bus bars that are the interconnection TSO/DSO transformers (EHV/HV). It uses the grid data and forecasted generation/load profiles known after the wholesale market results.
Responsible Partner	R&D NESTER and E-REDES
Type	Software
Innovativeness introduced compared to already existing Products/Services	It gives to the TSOs and DSOs the opportunity to get day-ahead short-circuit forecasts in order to improve operation planning activities. Nowadays, the Portuguese SOs do not track the short-circuit currents in the day-ahead timeframe, so, having this tool would be a novelty in their processes.
Unique Selling Point USP - Unique Value Proposition UVP	In the OneNet deliverables 9.2 and 9.5 , the tool is presented as well as the methodology behind it. For now, the tool will not be provided (delivered, experienced or acquired) publicly. However, the Portuguese TSO (REN) and DSO (E-REDES) will test it and try to integrate it in their usual operational planning procedures (if the testing phase is successful).
"Market" – Customers	TSOs and DSOs. To use the tool the customers (i.e. TSOs and DSOs) need to provide the network data and short-circuit parameters as input.
"Market" - Solution already on the market	NA
Open Source (yes/no)	No
Exploitation Strategy	<p>New Product/Service and technology transfer.</p> <p>In the OneNet deliverables 9.2 and 9.5, the tool will be presented as well as the methodology behind it. The goal is also to build on top of this tool some new features that can fit in some future EC calls scope. When it reaches a stage of maturity ready for market deployment the commercialization as SaaS is one hypothesis under analysis.</p> <p>In deliverables 9.2 and 9.5, the tool/module will be presented as well as the methodology behind it. For now the tool will not be provided (delivered, experienced or acquired) publicly. However the Portuguese TSO (REN) and DSO (E-REDES) will test it and try to integrate it in their usual operational planning</p>

	procedures (if the testing phase is successful). It can be used as basis to be improved in future EC projects and replicable in other realities.
TRL before the project	4
TRL after the project	7
TRL required by GA	demonstrating OneNet Innovation pillars to TRL minimally from level 6 to 8 validated through field trials.

3.7 Flexibility Market Platform

Name:	Flexibility Market Platform
Description	Flexibility market platform is a newly developed software solution that complements existing SCADA systems of DSOs and enables them to procure and activate flexibility services to tackle distribution grid limitations (congestion management, voltage control). Flexibility platform extends national data hub with the functionalities to trade with the flexibility products for DSO purposes. It enables prequalification of consumers and aggregators as flexibility service providers, announcing open tenders, conducting auctions, transfers activation signals from DSO to FSP, and performs billing and evaluation of activation responses.
Responsible Partner	Elektro Ljubljana, Elektro Gorenjska
Type	Software
Innovativeness introduced compared to already existing Products/Services	This platform is opening the market for new products -> very innovative since it has not been done before in SLO.
Unique Selling Point USP - Unique Value Proposition UVP	This platform enables FSPs and customers to participate in markets that were off reach before.
"Market" – Customers	<ul style="list-style-type: none"> • DSOs (taking on the role of MO as well) • FSPs: <ul style="list-style-type: none"> ○ Aggregators ○ Households with batteries ○ Households with PVs ○ Households with heat pumps ○ Commercial and industry consumers with flexibility (not used in SI demo) • Researchers
"Market" - Solution already on the market	None in SLO
Open Source (yes/no)	No
Exploitation Strategy	New product/service

	Public campaign, National metering data hub extended with functionalities to offer, sell and activate flexibility products aimed for end customers as well as for aggregators. This is all provided by DSOs (who act as MO as well). The business case is that aggregators and customers get paid for the delivered activation energy, as described in the settlement BUC. It is suitable for locations, where such costs are lower than additional investments in the grid.
TRL before the project	Ready to use, TRL 7
TRL after the project	Developed, TRL 9
TRL required by GA	demonstrating OneNet Innovation pillars to TRL minimally from level 6 to 8 validated through field trials.

3.8 Module for automated activations

Name:	Module for automated activations enables scalability of flexibility projects
Description	<p>Mechanism of activations reflect good practices from TSOs on the mFRR market -> not innovative, just transmitting working approaches to new markets</p> <p>Automatic activations have already been deployed. Activation results are available. Activation signals are also delivered through the market platform.</p> <p>FSP equipped each demo location with IoT dongle for capturing measurements from household energy meter and controller with 4G modem for transmitting measurement data and receiving activation signals, which are transferred to separate devices. When the DSO orders an activation via the CIM XML file, the Gen-I VPP receives this order and produces an activation signal through already existing pooling algorithms, which is then transmitted through the IoT platform to all the relevant controllers at requested demo site.</p> <p>In the DSO site, the module for automated activations automatically sends activation messages to aggregator when overload of MV/LV transformer occurs. Overload is detected, when close-to-real-time measurements of MV/LV transformer exceeds the thermal limit power, which is taking into account outside temperature.</p> <p>In the other DSO site, the module for automated activations automatically sends activation messages to aggregator when overvoltages on usage points occur. Overvoltages are detected when 1-minute meter measurements on usage points exceed the predefined voltage limit.</p>
Responsible Partner	Gen-I, Elektro Ljubljana and Elektro Gorenjska as DSOs
Type	Software
Innovativeness introduced compared to already existing Products/Services	This module uses the IoT concept and expands scalability of locations. With this module, DSOs' requests for Congestion management and Voltage control are automatically processed by the FSPs using standard CIM XML documents instead of manual activations (manual requests over telephone). This innovation increases reliability of service, reduces response time and enables higher scalability (handling a large number of flexibility assets simultaneously). End customers are not involved on a day-to-day basis, since it is all automated.

Unique Selling Point USP - Unique Value Proposition UVP	Set and forget for customers, no additional effort needed on their side after initial installation is done.
"Market" – Customers	DSOs receive highly responsive sources of flexibility; end customers receive a solution that requires no regular activities and aggregators receive an automated solution that only requires one time installation at customers.
"Market" - Solution already on the market	None in SLO
Open Source (yes/no)	No
Exploitation Strategy	The module for automated activation of aggregators on DSO side is operational (sending MQTT messages). Currently, the module for automated activation is used only in two Slovenian DSOs. In the future, other Slovenian DSOs will most likely use the same concept to make it nationally. It can be used both as positive or negative flexibility (decreasing load or generation).
TRL before the project	TRL 6
TRL after the project	TRL 9
TRL required by GA	demonstrating OneNet Innovation pillars to TRL minimally from level 6 to 8 validated through field trials.

3.9 atFlex Flexibility Market Platform

Name:	atFlex Platform
Description	<p>Web application³, which simulates flexibility market and allows to bid to cover needs for congestion management, voltage control and balancing market with a Day-ahead approach.</p> <p>atFlex Platform is Polish demo market platform. It is up and running - real activations are performed successfully. Flex register is carried out on the platform, bidding is allowed and enabled for FSPs, and verification is carried out by TSO (balancing services) and DSO (congestion management and voltage control).</p> <p>It is designed in client-server architecture. A web application is used on the client side. The application server and database are placed on Oracle Cloud and shared through proxy for public domain.</p> <p>A more specific description can be found in Polish Demo summary under Deliverable 10.4 "Report on demonstration".</p>
Responsible Partner	TTST, PSE, EOP, Enspirion, NCBJ
Type	Software
Innovativeness introduced compared to	Allowance to bid on congestion management, voltage control and balancing market simultaneously and with coordination between DSO and TSO.

³ <https://atflex-onenet.tt-cloud.com.pl/login>

already existing Products/Services	
Unique Selling Point USP - Unique Value Proposition UVP	Platform provides coordination schemes between DSO and TSO so as to fully use flexibility potential available on the market. It is first of its kind in the Polish market, due to lack of any ordinances in Polish law regarding the usage of flexibility potentials in the power system.
"Market" – Customers	DSO,TSO, Aggregator, Consumer, Energy Communities, Citizen & Consumer Organisations, FSPs
"Market" - Solution already on the market	-
Open Source (yes/no)	Yes - Transition-Technologies-Systems (github.com)
Licencing	Apache 2.0
Access and Support	<p>Accessibility through public domains: [DEV] atFlex Platform Admin (tt-cloud.com.pl) [DEV] atFlex Platform (tt-cloud.com.pl)</p> <p>from Monday to Friday and from 8 a.m. to 6 p.m. Application available until the end of OneNet Project – 31st of March 2024.</p> <p>Responsible party during and after project is Transition Technologies Systems Sp. z o.o.(TTST)⁴. Contact to company is described on the company's website. TTST will ensure to further develop the product. TTST will search for partners to continue and develop more pilot programmes with usage of this product. Thanks to this, support of the atFlex Platform will be continued.</p>
Exploitation Strategy	<p>The strategy to further exploit the product is to continue to develop this software. It means to use this product in next European research projects(if possible) and follow changes in policies – either national or European (i.e. NC DR⁵). Also it is planned to disseminate product throughout Polish DSO's and to find partner to continue the development. Main points of developments are:</p> <ul style="list-style-type: none"> • supporting communication with external billing system • supporting communication with external data measuring system • supporting communication with Polish TSO's system regarding grid integrity and security • developing changes from NC DR(mentioned above) <p>The platform will be used as a candidate for the official national platform for Polish flexibility platform.</p>
TRL before the project	TRL2
TRL after the project	TRL7
TRL required by GA	TRL7, demonstrating OneNet Innovation pillars to TRL minimally from level 6 to 8 validated through field trials.

⁴ [Transition Technologies-Systems - IT systems for the energy, gas and RES markets \(ttst.com.pl\)](https://ttst.com.pl)

⁵ [DSO Entity & ENTSO-E Public consultation on Network Code for Demand Response - European Network of Transmission System Operators for Electricity - Citizen Space \(entsoe.eu\)](https://entsoe.eu)

3.10 Non-frequency ancillary services market platform

Name:	Non-frequency ancillary services market platform
Description	The market platform is IT tool on central level allows multilateral interaction enabling flexibility offer/procurement at one centralized marketplace encompassing both active and reactive based flexibility/products.
Responsible Partner	ECD
Type	Software
Innovativeness introduced compared to already existing Products/Services	As far as the new market platform is concerned, it is supposed to provide know-how and insight into how the new market for non-frequency flexibility can be organized.
Unique Selling Point USP - Unique Value Proposition UVP	There is a general assumption, that the platform will help aggregators to generate more profit through enabling access to new markets with non-frequency services . However as this is only prototype (unlike the traffic light scheme) exact benefit cannot be calculated.
"Market" – Customers	Aggregators, DSOs and TSOs in Czechia.
"Market" - Solution already on the market	Prior to the project there was no dedicated solution available.
Open Source (yes/no)	No
Licensing	No (just prototype solution)
Exploitation Strategy	Lessons learned from market platform design will be used in business specification for new robust central national system for data exchange, currently in preparation in CZ (expected GO-LIVE 2026). The exercise on new markets for non-frequency flexibility will provide an insight into how the future market might work. This system (country-wide solution) is now in preparation.
TRL before the project	1
TRL after the project	6
TRL required by GA	6 (demonstrating OneNet Innovation pillars to TRL minimally from level 6 to 8 validated through field trial)

3.11 F-channel forecasting module

Name:	F-channel forecasting module
Description	The F-channel platform itself represents one of the main outcomes of the effort invested in the Greek Demo and, since this module is a part of it, the development of the platform is the direct prerequisite for the usage of this module; the F-channel platform and its functionalities is described in deliverables, such as, for instance, D8.1 and D8.2 . Its forecasting module is the

	<p>forecasting and data analysis tool for procuring flexibility, for enhancing grid observability and reliability, and for network planning.</p> <p>The implemented forecasting module of F-channel can be used</p> <ul style="list-style-type: none"> to forecast weather data and energy production and consumption time series by TSOs, DSOs, aggregators, traders, RES producers, and consumers. to enhance grid observability and reliability from TSOs and DSOs. That mitigates overloading of OHLs and HV/MV transformers and avoids possible violations of voltage limits. Also it can provide early warnings in case of hazardous power system regimes (icing, outages – based on weather information). to enhance network planning via providing greater confidence and coordination when making strategic investments. The aspects of network planning are i) modelling of supply and demand, ii) identification of system needs, iii) identification of options for addressing system needs, and iv) make decisions on which options to progress.
Responsible Partner	UoA
Type	Software
Main Impact Domain	Commercial and Technical
Innovativeness introduced compared to already existing Products/Services	<p>There are several commercially available forecasting tools. The implemented module makes use of advanced AI algorithms that provide predictions both for the weather and the related energy variables (production and consumption). Accuracy of these predictions exceeds the accuracy of the currently applied methods significantly.</p> <p>In addition, there is a relatively large number of commercially available tools capable of running the load-flow assessments and N-1 reliability analyses of the power system, most of them are revolving around providing the results in the numerical, rather than graphical form, let alone projecting them directly on the map of the system. Having the source codes intended both for conducting the calculations and showing them in the map included in GUI could prove to be a great asset for anyone interested in the state of the system, including both the operators and the other entities participating in the market.</p> <p>In the currently available tools, the typical tabular representation is used. One of the main outcomes of the F-channel platform is the switch from the typical tabular representation of the power system to the georeferenced maps on which the system is shown in real-life environment. Not only will the system itself be shown, but the results of any calculations and the effects of any major changes will be graphically presented in the appropriate way. This is bound to increase the comprehensiveness of the results, potentially making the gravity of some of them understandable even for the public representatives not familiar with the power system topic.</p>
Unique Selling Point USP - Unique Value Proposition UVP	The accuracy of demand and production predictions largely affects the performance of the DSO and TSO in using flexibility services. The F-channel module vastly increases the forecasting precision (for the wind plants, the error of production was reduced from about 9% to about 3% (or 1%, depending on the

	<p>plant); for the solar plants, the error was reduced from between 5% and 10% to 4% (or 1%, depending on the plant)).</p> <p>In addition, the module that aids in enveloping both system state analyses that need to be conducted on a day-to-day basis and projecting the results of those calculations on the map of the system is a major improvement compared to the currently available tools that are mostly capable of either the first or the second function. Having that kind of asset in possession could prove to be worthy to the different entities that are participating in the energy market.</p> <p>Finally, F-channel will enable the energy entities (both the TSO, DSO, and the other participants in the energy market) to illustrate the state of the system and the potential consequences of some action in an easy and understandable manner. This, in turn, not only increases the chance of explaining the results to the public, improving the transparency aspect of the companies' operation, but also enhances the cooperation between the system entities that participate in the processes, making those simpler and more efficient.</p>
"Market" – Customers	<ul style="list-style-type: none"> • System operators (TSOs and DSOs). • Renewable sources investors. • Prosumers that are willing to offer their services to the grid. • Aggregators. • Large industrial consumers. • Scientific community.
"Market" - Solution already on the market	<p>There is a variety of forecasting tools related to the power system, but we are not aware of such precision that F-channel achieves.</p> <p>There is a variety of tools for the power system analyses, but we are not aware of the codes and packages capable of real-life projection of the results on the map.</p>
Open Source (yes/no)	No
Licencing	Role-based, each of the users gets a license for their assigned role in the process. The licenses will be related to accounts, not to physical machines.
Access and Support	The module can be accessed by the users by logging in to the web platform for which the link is provided to them at the start of the exploitation. At this point, there is nobody who is responsible for the maintenance of the platform and the provision of technical support for the users. If and when the tool becomes commercially used, these aspects would need to be decided upon, with the network of technical support and responsible people expanding with each new user that decided to try the platform. Support can be obtained with a super-admin account which has access to backend databases and Linux server settings. Also, the app can be dockerized if needed for commercial purposes.
Exploitation Strategy	<p>Basis for the development of the new solutions that will be commercially available to the interested users.</p> <p>The best way of implementing this principle in the market is via the developed software solutions based around it.</p> <p>The tool uses open-source coding languages, with the option to deliver services together with the app. Services would be offered on the market, but</p>

	the app and its functionality would be in a GUI, with some of the basic services offered free of charge for a certain period of time.
TRL before the project	3 – 4 Basic idea on principle developed upon the knowledge and experience of the involved partners.
TRL after the project	6 Fully developed method of the system representation already implemented in the software tool created in the demo.
Minimum TRL required by GA	demonstrating OneNet Innovation pillars to TRL minimally from level 6 to 8 validated through field trials

3.12 F-channel coordination module

Name:	F-channel coordination module
Description	The F-channel platform is the web based, client server application for TSO-DSO coordination. It represents one of the main outcomes of the effort invested in the Greek Demo. Since the coordination module is a part of it, the development of the platform is the direct prerequisite for the usage of this module. The F-channel platform and its functionalities are described in deliverables D8.1 and D8.2 . Its coordination module provides an efficient and reliable model of communication between energy entities in the system. This module can be used to connect the TSO and the DSO and enable the exchange of the essential information to procure flexibility, new services in the grid, and improve the existing ones (congestion management, voltage control, etc.). The Coordination module can also be adopted within the existing markets that procure capacity. Therefore, the F-channel platform will introduce the advanced way of the real-time communication between the different participants in the energy market. The F-channel coordination can be seen as a benchmark platform that connects TSOs and DSOs and, as such, a potential example for the future tools that will try to cover the same topic.
Responsible Partner	UoA
Type	Software
Main Impact Domain	Commercial and Technical
Innovativeness introduced compared to already existing Products/Services	One of the main concerns in the modern visions of the power systems, containing the larger number of participants and the decentralized energy production is the establishment of the reliable way for the data exchange between the participants. Although there are attempts at building the channels for communication between different types of participants, we are not aware of any of those being capable of including all of the interested sides in the energy market, the task that can hopefully be achieved by the technical solutions developed within the demo.
Unique Selling Point USP - Unique Value Proposition UVP	If one was to consider the modern vision of the power systems, they would easily conclude that the fact that the number of entities that are expected to participate in the everyday processes is set to grow rapidly compared to the state

	that is currently valid. This can be seen in two ways – as a great issue or as a great potential, with the latter being primarily based on the fact that the system could count on a larger number of flexibility options in case of a need, but only if there is a reliable way of communicating among all of the entities. If not, then the former becomes valid. This KER hopes to provide an answer to this issue and, hence, become a go-to option for the entities.
"Market" – Customers	<ul style="list-style-type: none"> • System operators (TSOs and DSOs). • Renewable sources investors. • Prosumers that are willing to offer their services to the grid. • Aggregators. • Large industrial consumers.
"Market" - Solution already on the market	We are not aware of such a solution.
Open Source (yes/no)	No
Licencing	Role-based, each of the users gets a license for their assigned role in the process. The licenses will be related to accounts, not to physical machines.
Access and Support	The module can be accessed by the users by logging in to the web platform for which the link is provided to them at the start of the exploitation. At this point, there is nobody who is responsible for the maintenance of the platform and the provision of technical support for the users. If and when the tool becomes commercially used, these aspects would need to be decided upon, with the network of technical support and responsible people expanding with each new user that decided to try the platform. Support can be obtained with a super-admin account which has access to backend databases and Linux server settings. Also, the app can be dockerized if needed for commercial purposes.
Exploitation Strategy	<p>By developing the new protocols and communication standards based on the usage of the principles implemented in the platform delivered by the demo.</p> <p>From our point of view, the best way of integrating this solution in the market is by implementing it in the standard communication protocols between the participants in the energy market, either by developing a tool that would be built upon it or by allowing the entities to create their own tools for this purpose. Therefore, the module can be seen both as the basis for potentially ready-to-use tools that can be sold to the operators and other entities in the energy market and as the foundation for the future research and exploitations dealing with the similar topics.</p>
TRL before the project	<p>3-4</p> <p>Basis made upon the experience of both the partners involved in the demo and the colleagues from the various entities, such as the system operators, for instance.</p>
Minimum TRL required by GA	demonstrating OneNet Innovation pillars to TRL minimally from level 6 to 8 validated through field trials
TRL after the project	6

	Fully developed solution for the real-time communication between the entities in the system, verified within the platform created within the demo.
--	--

3.13 Active balancing and congestion management platform (ABCM)

Name:	ABCM platform
Description	<p>This is a platform that includes several tools for the operators such as:</p> <ul style="list-style-type: none"> • Dynamic real-time monitoring based on PMUs and SCADA measurements. • Pre-qualification of location-based services. • Online evaluation of services provision. • Coordination of ancillary services provision by FSPs. <p>The software platform has been developed and running in a local server, within the premises of UCY where the real time simulator is installed and the digital twin is executed. The platform receives measurements from either Phasor Measurement Units (PMUs), smart meters, or SCADA so it needs the support of such infrastructure. The platform is more related to the management of the distribution grids considering congestion issues (i.e., overloading of lines, voltage limit violation). Further to that the platform has direct communication with market platforms and flexible consumers through the OneNet system in order to perform online evaluation of the provision of services and co-ordination of the ancillary services provided by the FSPs. More details about this platform and the architecture behind it can be found on Deliverable 8.1. It should be noted that this software platform that enables the interaction with the power system digital twin can be reproduced in other environments as well, through the modification of the required middleware, which is responsible for the integration between software platform and the digital twin, smart meters and actuators.</p> <p>This KER is demonstrated at TRL 6-7 and is in line with the three innovation pillars of the OneNet project.</p>
Responsible Partner	University of Cyprus
Type	Software
Main Impact Domain	The impact domain of the ABCM platform is in the monitoring, control and management of transmission and distribution grid.
Innovativeness introduced compared to already existing Products/Services	<ul style="list-style-type: none"> • Real time monitoring capabilities for both transmission and distribution grid • Seamless and automated order prequalification for preventing operational limit violation to enable the TSO-DSO collaboration • Real time coordination for congestion management of the distribution grid through non-wired, non-standard solutions using flexibility provided by inverter-based resources (such as phase balancing).
Unique Selling Point USP - Unique Value Proposition UVP	<p>The ABCM will provide several benefits to the end-users:</p> <ul style="list-style-type: none"> • Enhanced situational awareness. • Reduced operational cost for distribution grid. • Prevention of congestion.

"Market" – Customers	<ul style="list-style-type: none"> • TSOs • DSOs
"Market" - Solution already on the market	Monitoring tools exist in several SCADA solutions however the rest of the tools are not considered in any commercialized solutions.
Open Source (yes/no)	No
Exploitation Strategy	<p>The new services, developed mainly by UCY and integrated within the ABCM platform will address the needs of the Transmission and the Distribution system operator for exploiting flexibility services to manage the grid operation.</p> <p>The following market strategy will be followed:</p> <ul style="list-style-type: none"> • Perform market analysis. (1 year after the project) • Develop a business plan. (1 year after the project) • Identify potential customers. (1 year after the project) • Perform a complete feasibility study including possible financial projection, explore the possibility to create a spin-off company that can exploit the IPRs and turn the prototype into a minimum valuable product and seek for investors. (2 year after the project)
TRL before the project	3-4
TRL after the project	6-7
TRL required by GA	demonstrating OneNet Innovation pillars to TRL minimally from level 6 to 8 validated through field trials

3.14 Multisided platform for residential DER flexibility autotrading

Name:	Multisided platform for Residential DER flexibility autotrading
Description	<p>This platform allows to orchestrate Distributed Energy Resource (DER) controls in the residential environment and covers a key business process to automate prosumer interactions with TSO-DSO near real-time flexibility markets through CIM based APIs including :</p> <ul style="list-style-type: none"> • Statistical baseline nomination based on DER Dedicated Measurements Devices • Automatic DER Flexibility calculation and bidding per DER Group • Automatic DER flexibility activations • Ex-ante DER flexibility observability • Ex-post DER flexibility settlements <p>The platform has been implemented as a cloud service through Digital4Grids cloud infrastructures and tested through the Estonian pilot for interactions with 14 homes integrating different kind of Distributed Energy Resources with associated Dedicated Measurement Devices installed for the purpose of the Onenet demonstration.</p> <p>This KER is demonstrated at TRL 5-6 and confirms that the Near real-time products envisaged through the Northern demonstrator are compatible with Residential assets equipped with Dedicated Measurements Devices.</p>

Responsible Partner	Digital4Grids
Type	Software
Main Impact Domain	The proposed platform introduces new transactive control methods for Distributed Energy Resources in residential environments and validates the IEC CIM based standards (IEC62325 European Style Market Profiles and IEC62746) are fit for the purpose of System Operator – Flexibility Service provider data exchange. The result can directly serve to validate next regulatory steps through the Demand side flexibility code as well as the implementing act for Demand side flexibility data interoperability. Furthermore, it highlights the strategic importance of Dedicated Measurement Devices for the management of residential Flexibility as well as the importance to reconsider current statistical baseline methods to evolve towards near real-time nominations or Meter Before / Meter After methods.
Innovativeness introduced compared to already existing Products/Services	<ul style="list-style-type: none"> • Real time DER transaction management leveraging data streaming interfaces (e.g. MQTT and Kafka) • Seamless and automated baseline nomination and biddings considering different configuration flexibility price by residential DER assets • Real time ex-ante flexibility monitoring down to second for Significant Grid users such as EV Chargers, Residential Batteries allows direct emergency post-market controls by DSOs (to correct low voltage congestions not considered as part of the flexibility market) • Flexibility DER aggregation per Grid node, bidding zone as well as flexibility product types to maximize DER flexibility stacking
Unique Selling Point USP - Unique Value Proposition UVP	<p>The Auto trading platform will provide several benefits to the end-users as well as System Operators:</p> <ul style="list-style-type: none"> • Opportunity to Distributed flexibility revenues to end users investing in DER • Possibility to stack flexibility revenue across different markets . • Transparency on flexibility benefits down to individual transaction to develop end user trust and transparency. • Automated lowest cost aggregation, open to real-time AI calculations • Extended observability of Flexibility events to end users down to real-time allowing System Operator to integrate back up emergency response strategies • Settlement down to individual DER assets allows hybrid flat and dynamic prices in the same home environment
"Market" – Customers	<ul style="list-style-type: none"> • Flexibility Service Providers • DER control operators • Residential users
"Market" - Solution already on the market	Similar solutions exist for large Commercial and Industrial assets but have so far never been deployed at lowest residential asset levels.
Open Source (yes/no)	No. All data exchange layers are opensource while some software components are owned by Digital4Grids. Digital4Grids intends to expand the data exchange layers to integrate through future energy data spaces leveraging Kafka streaming infrastructures.
Exploitation Strategy	The platform will be further tested in the context of the Eddie dataspace project integrating with new other market interfaces. Partnership discussions have been

	started with different actors aiming at launching the platform commercially within end of 2024 targeting in particular self-consumption energy communities which are new actors entering into the residential flexibility space.
TRL before the project	2-3 (Minimum Viable Product demonstrated through the Interrface Cascade funding for limited DER flexibility monitoring)
TRL after the project	5-6
TRL required by GA	demonstrating OneNet Innovation pillars to TRL minimally from level 6 to 8 validated through field trials

3.15 TSO-DSO Coordination Platform

Name:	TSO-DSO Coordination Platform
Description	TSO-DSO Coordination Platform is a software module that enables seamless and coordinated procurement of flexibility for system services (through different flexibility products) to meet the needs of participating TSOs-DSOs in the most efficient way (see deliverable 7.4 for further details).
Responsible Partner	Cybernetica
Type	Software
Main Impact Domain	Commercial
Innovativeness introduced compared to already existing Products/Services	Operating with consolidated flexibility products in multiple regions in harmonized way.
Unique Selling Point USP - Unique Value Proposition UVP	Exact match to flexibility market participants needs by means of product definitions and process flow. Direct and customized digital interface to stakeholder internal systems for getting/setting relevant data.
"Market" – Customers	DSO/TSO, FSPs, MOs
"Market" - Solution already on the market	Many Horizon projects propose different approaches to product definitions.
Open Source (yes/no)	No
Exploitation Strategy	<ul style="list-style-type: none"> • New product • Direct industrial use • License agreement • Publications <p>Results will be communicated to the stakeholders of concerned countries, mostly via dedicated events and, if needed, guidance and additional legislation</p>
Status of IPR (if applicable)	Proprietary Licensing. Company will have to agree to the Terms and Conditions software remains the property of the provider.
TRL before the project	TRL 6

TRL after the project	TRL 8 Adding more TSOs, DSOs, FSPs, and MOs to test and qualify the solution.
TRL required by GA	6-8 (Relates to Innovation Pillar 3: Integrated and interoperable data and platform architecture))

3.16 Optimization-based market clearing module

Name:	Optimization-based market clearing module
Description	<p>A market clearing engine for a regional flexibility market (including multiple TSOs and DSOs). Please refer to Chapter 4 of OneNet D7.4“TSO-DSO Coordination module description and implementation”⁶. The module enables:</p> <ol style="list-style-type: none"> 1. Jointly meeting flexibility needs of all SOs in an automated and optimal manner <ol style="list-style-type: none"> a. Maximizing procurement efficiency (minimizing flexibility procurement costs) b. Ensuring adequate FSP remuneration c. Meeting the bids’ technical requirements d. Meeting the grids’ operational limits 2. Enables the optimal trading/procurement of different products, namely: near real-time active energy (NRT-P-E), short-term active energy (ST-P-E), short-term capacity (ST-P-C), long-term capacity (LT-P-C), long-term capacity with activation stage (LT-P-C/E-res is the product for the reservation stage and LT-P-C/E-act is the product for the activation stage) 3. For the NRT-P-E product, the module also allows linking with MARI for the forwarding of flexibility bids from the regional platform to MARI, maximizing the value potential of flexibility bids. The forwarding of bids goes through a MARI check and a grid check process to ensure, respectively, that the forwarded bids abide by MARI’s bid requirements, and that the forwarded bids do not pose constraint violation risks to the local/national grids if activated by MARI. 4. The module is automatically usable and accessible through a developed API. 5. The module was tested and its operation successfully demonstrated within the TSO-DSO coordination platform of the OneNet northern cluster (WP7) <p>Receives as input:</p> <ol style="list-style-type: none"> 1. The set of flexibility bids submitted and their technical requirements (accepts different types of simple and complex bids – in harmonization process with MARI bid requirements – namely, fully divisible, fully

⁶ https://onenet-project.eu/wp-content/uploads/2022/12/OneNet_D7.4_v.1.0.pdf

	<p>indivisible, partially divisible, multipart (parent/children), and exclusive set bids),</p> <ol style="list-style-type: none"> 2. The system operators' network information, 3. A purchase offer (fundamental information provided by the SOs to launch the market clearing process). <p>Outputs the market clearing results, including (key outputs, among others):</p> <ol style="list-style-type: none"> 1. The market clearing output status 2. The portion of each bid to be cleared/purchased, 3. Total flexibility procurement costs, 4. Updated network state (updated flows and imbalance position) 5. For the NRT-P-E product, the list of bids to be forwarded to MARI
Responsible Partner	VITO
Type	Software
Main Impact Domain	Commercial
Innovativeness introduced compared to already existing Products/Services	<p>Currently available flexibility market platforms typically do not consider grid limitations in the market clearing (or only to a limited extent), and typically rely on a manual market clearing process, or on a simplified process solely based on bid prices without considering the bid's impact on the different network elements and operational requirements, which can be suboptimal and prone to mistakes and transparency issues. These aspects are addressed in the developed optimization-based market clearing module, to automatically optimize and clear the most-optimal set of bids, while taking into account their impacts on the grid operation (resolving existing issues and not causing unintended additional violations).</p> <p>In addition, the developed optimization-based market clearing module allows solving multi system operators needs concurrently (considering their flexibility needs as well as their operational network constraints) including multiple products for multiple countries, which is a key innovative aspect.</p>
Unique Selling Point USP - Unique Value Proposition UVP	<p>Optimization-based market clearing enabling each system operator (SO) to meet their flexibility needs, at minimum possible cost, while abiding by the grid limitations of all the grids involved, as well as the technical limitations of the submitted bids. Hence, this offers a joint grid impact and bid impact assessment mechanism embedded in the optimal market clearing process, returning optimal and grid impact-aware/safe market clearing outcomes. The developed optimization-based market clearing module allows optimally solving multi system operators needs concurrently (considering their flexibility needs as well as their operational network constraints), enables the trading of multiple flexibility products (of different types, e.g., capacity and energy; at different time horizons: near real time, to short and long term) for multiple countries.</p> <p>The process is time efficient, explainable and traceable for maximum transparency, and is automatically usable through a developed API.</p> <p>The process is based on a multipurpose global optimization process:</p> <ol style="list-style-type: none"> 1. Jointly meeting flexibility needs of all system operators 2. Maximizing procurement efficiency (min procurement costs) 3. Ensuring adequate flexibility service providers' (FSPs) remuneration

	<p>4. Meeting the bids' technical requirements</p> <p>5. Meeting the grids' operational limits</p> <p>When applicable (at the moment, for the NRT-P-E product), the module also allows linking with MARI for the forwarding of flexibility bids from the regional platform to MARI, maximizing the value potential of flexibility bids. The forwarding of bids goes through a MARI check and a grid check process to ensure, respectively, that the forwarded bids abide by MARI's bid requirements, and that the forwarded bids do not pause constraint violation risks to the local grids if activated by MARI.</p>
"Market" – Customers	<ul style="list-style-type: none"> • System operators (both transmission system operator, TSOs, and distribution system operators, DSOs). • Market operators (MOs).
"Market" - Solution already on the market	No solution on the market with the introduced features and functionality. Collaboration possible with existing flexibility and electricity market platforms to integrate the optimization-based market clearing module in their market clearing process.
Open Source (yes/no)	no
Exploitation Strategy	<ul style="list-style-type: none"> • New service • License agreement • Direct industrial use • Technology transfer <ol style="list-style-type: none"> 1. Development and testing within the Northern cluster demonstrator (WP7). 2. Showcase the functionality to potential customers through workshops, meetings, and public deliverables. 3. Advance in technology readiness level to take the product to market. <p>Development is within the Northern demo cluster of OneNet (WP7). The process is gaining additional “market” maturity as part of the development process (including methodological developments as well as IT developments). Time to market can be 0 – 5 years after completion of OneNet, in case the opportunities for further development are there.</p>
TRL before the project	TRL 4
TRL after the project	<p>TRL 7</p> <p>Fully developed and successfully tested/demonstrated in an operational environment as part of the OneNet northern demo cluster including TSOs and DSOs from 4 different countries: Finland, Estonia, Latvia, and Lithuania.</p>
TRL required by GA	TRL 6 – 8 (Relates to Innovation Pillar 3: Integrated and interoperable data and platform architecture)

3.17 Flexibility Register

Name:	Flexibility Register
-------	----------------------

Description	Flexibility register is a software module that stores and manages information about resources participating on flexibility markets, and conducts processes for contract management, prequalification and verification and settlement. Flexibility register is closely integrated with TSO-DSO coordination platform and Market operator platforms to enable a well-functioning local flexibility market (see deliverable 7.2 for further details).
Responsible Partner	Cybernetica
Type	Software
Main Impact Domain	Commercial
Innovativeness introduced compared to already existing Products/Services	Facilitating harmonized information exchange and data management to enable novel processes for local flexibility markets.
Unique Selling Point USP - Unique Value Proposition UVP	Efficient management of data needed by local flexibility markets, which allows SOs to procure flexibility from multiple resources and multiple markets.
"Market" – Customers	DSO/TSO, FSPs, MOs
"Market" - Solution already on the market	Similar systems are piloted in different projects, but off-the-shelf products are not widely available.
Open Source (yes/no)	No
Exploitation Strategy	<ul style="list-style-type: none"> • New product • Direct industrial use • License agreement • Publications <p>Results will be communicated to the stakeholders of concerned countries, mostly via dedicated events and, if needed, guidance and additional legislation</p>
TRL before the project	TRL 6/8 Functionalities of Single Flexibility Platform taken as starting point from project INTERFACE (TRL 8). Further functionalities i.e. flexibility contract management, baseline calculation and settlement functionalities, further common flexibility products (TRL 6).
TRL after the project	TRL 8 Adding more TSOs, DSOs, FSPs, and MOs to test and qualify the solution.
TRL required by GA	TRL 8

3.18 Nord Pool locationally enhanced intraday module

Name:	Nord Pool locationally enhanced intraday module
Description	Nord Pool will include locational information to Intraday market bids and expose these locational orders to a flexibility market coordination platform operated by

	the system operators. Please refer to OneNet D7.3 "Report on market functionality".
Responsible Partner	Nord Pool
Type	Software
Main Impact Domain	Commercial
Innovativeness introduced compared to already existing Products/Services	Enhancing Intraday market orders with locational information allowing activation of flexible asset in a dedicated geographical location instead of a wider bidding zone. The same order can be matched on the Intraday market or on the flexibility market adding needed liquidity on both sides.
Unique Selling Point USP - Unique Value Proposition UVP	Customer can offer their flexible assets on a wider market with more commercial potential instead of being limited to a small, fragmented and use case specific market.
"Market" – Customers	FSPs with control over flexible assets. System operators with need for flexibility.
"Market" - Solution already on the market	Flexibility markets exist in the open, but none offer combined Intraday market access.
Open Source (yes/no)	No
Exploitation Strategy	<p>Work done and knowledge gained in OneNet will form basis for Nord Pool's future work on flexibility markets in Europe.</p> <p>Add-on to existing Intraday market offering for Nord Pool members.</p> <p>Nord Pool will facilitate flexibility trading by utilizing Intraday platform. The flexibility orders can be activated for any need the SOs might have. Flexibility asset owners can also offer the same asset on the intraday market with the same order which will help them to commercialise the asset more as they have a broader possibility to trade the flexibility. Normal business model is based on annual fees to access markets plus a variable fee which is charged per traded volume.</p> <p>Results of the project will be communicated to the stakeholders of concerned countries, mostly via dedicated events and, if needed, guidance and additional legislation.</p> <p>Time to Market 2024</p>
TRL before the project	TRL 1
TRL after the project	TRL 6
TRL required by GA	TRL 6-8 (Innovation Pillar 3: Integrated and interoperable data and platform architecture)

3.19 Flexibility Market Platform

Name:	Flexibility Market Platform
-------	-----------------------------

Description	<p>Modular approach of platform which support the E2E flexibility process. Deliverable D10.4 gives information about the architecture of the platform.</p> <p>The platform uses Flexibility register for the prequalified assets, network calculation module for flexibility needs calculation, market module which is an optimization engine, smart control for activation scheduling, and metering/validation module to create analytics for settlement with flexibility Service Provider.</p>
Responsible Partner	E.ON Hungaria EDE
Type	Software
Innovativeness introduced compared to already existing Products/Services	This platform is opening the market for new products -> very innovative since it has not been done before in HU
Unique Selling Point USP - Unique Value Proposition UVP	This platform enables customers (Flexibility Service Providers on MV, HV/MV, HV level) to participate in markets that were off reach before. FSPs can access to the platform to give offers. FSPs receive bid results, activation schedule via mail with link.
"Market" – Customers	<ul style="list-style-type: none"> • DSOs (Market Operator) • Aggregators • Flexibility Service Providers
"Market" - Solution already on the market	None in HU
Open Source (yes/no)	No
Exploitation Strategy	<p>New product/service</p> <p>Due to the PV proliferation MV and HV/MV, congestions may occur. Instead of CAPEX, DSOs can use flexibility based on OPEX. Potential FSPs are the PVs who cause the congestion. The developed product are described in Deliverable D10.4 (four products: two must run and two limit types). The DSO buys the service based on different products.</p> <p>A public campaign for potential FSPs is needed in order that they become familiar with the products, bid structure. Also important is the incorporation of conceived products into HU DSO Network Code, communication during prequalification process with FSPs about products and policy</p>
TRL before the project	Ready to use, TRL 4
TRL after the project	Developed, TRL 8
TRL required by GA	TRL 8

3.20 DSO Flexibility Needs Evaluation, Sensitivity factor calculation

Name:	DSO Flexibility Needs Evaluation, Sensitivity factor calculation
-------	--

Description	<p>The main function of the network calculation module is to generate the network limit list with the necessary parameters, which it passes to the market module. The basis of the calculation is State Estimation.</p> <p>The module uses not only topological data, but so-called pseudo measurements which have different accuracy and thus affect the final result of the calculation to a different extent, which is due to the WLS method. SE provides a network limit list with the calculated parameters and their standard requirements, and the load flow part of the module provides the sensitivity factors. The load flow is run during each W-1 calculation, as it seemed more economical to run it for the given N-1 states than to consider each N-1 state and store the values in the sensitivity factor matrix.</p>
Responsible Partner	E.ON Hungaria EDE
Type	Software
Innovativeness introduced compared to already existing Products/Services	The Network calculation module uses State Estimation which can increase the accuracy of results if there are additional measurements as inputs. The module furthermore uses the so-called Sensitivity factor, which inherently connected to Market optimization module, it describes the impact of FSP on congestion.
Unique Selling Point USP - Unique Value Proposition UVP	This platform enables DSO to define the place and degree of possible congestion.
"Market" – Customers	<ul style="list-style-type: none"> • DSOs (Market Operator) • Aggregators • Flexibility Service Providers
"Market" - Solution already on the market	None in HU
Open Source (yes/no)	No
Exploitation Strategy	<p>New type of network calculation</p> <p>Public campaign, communication during prequalification process with FSPs about the importance of sensitivity factor</p>
TRL before the project	Ready to use, TRL 4
TRL after the project	Developed, TRL 8
Minimum TRL required by GA	TRL8

4 Other Exploitable Results

4.1 Study on coordination models

Name:	Study on coordination models. This study is included in OneNet Deliverable D9.4 - OneNet D9.4 deliverable – Validation & result of concept test
Description	The French demonstration studied innovative ways of TSO-DSO information exchange in the context of DER activation. The so-called “shared information TSO-DSO congestion management in case of activation of distributed flexibility” aims to study the future needs in flexibility and their usage both for RTE and Enedis and analyze what coordination issues could arise consequently.
Responsible Partner	RTE, Enedis
Type	Other
Main Impact Domain	TSO-DSO coordination
Innovativeness introduced compared to already existing Products/Services	Synthesis of existing and future flexibility usages, and possible future leads to optimize TSO-DSO interactions in this context
Unique Selling Point USP - Unique Value Proposition UVP	Reflection on TSO-DSO coordination enhancements
"Market" – Customers	TSO - DSO
"Market" - Solution already on the market	NA
Open Source (yes/no)	NA
Exploitation Strategy	Starting point for possible future collaboration
TRL before the project	NA
TRL after the project	NA. As the KER is a preliminary study on future TSO/DSO cooperation leads, it cannot be given a proper TRL. The level of the continuation of the study will depend on the future collaboration objectives, considered technologies and regulatory aspects which have not been defined yet

4.2 Methodology for the estimation of flexibility potential from MV clients

Name:	Methodology for the estimation of flexibility potential from MV clients
Description	Methodology to estimate the flexibility potential from MV clients that responded to a consumer survey launched. The methodology is explained in D9.2. The MV clients considered will a significant group of supermarkets from a national supermarket chain (Continente), and the analysis will follow the steps: <ul style="list-style-type: none"> • Clusters formation methodology and results

	<ul style="list-style-type: none"> • Load modeling and constraints • Flexibility estimation and uncertainty evaluation
Responsible Partner	InescTec, E-REDES, R&D NESTER, REN
Type	Methodology
Innovativeness introduced compared to already existing Products/Services	Not a product/service, it's the methodology we have used to support the UC simulations. Two innovative aspects: 1) Event driven load estimation; 2) Uncertainty inclusion in the simulations.
Unique Selling Point USP - Unique Value Proposition UVP	The generic consumer will be able to understand what the potential of the estimated flexibility is, and what are the considerations in terms of infrastructure to actually achieve the provision.
"Market" – Customers	<ul style="list-style-type: none"> • Portuguese large electricity consumers connected to the DSO. • Portuguese large electricity consumers connected to the TSO. • Other research organisations planning to replicate the methodology. • Aggregators planning to operate in Portugal.
"Market" - Solution already on the market	There are event driven methodologies for load identification/disaggregation.
Open Source (yes/no)	NA
Exploitation Strategy	<p>Other willing research organisations may want to replicate the methodology we are considering in our simulations.</p> <ul style="list-style-type: none"> • As a dissemination channel, a workshop was promoted to explain flexibility and the estimation methodology. Moreover, public project deliverables from WP9 are available. • No resource to go to market are foreseen as it is not a market service/tool but a methodology.
TRL before the project	NA
TRL after the project	NA

4.3 TSO-DSO coordination algorithms

Name:	TSO-DSO coordination algorithms
Description	<p>The offers are filtered (and combined) by the TSO-DSO coordination algorithms in order to ensure a secure procurement of the DERs in the DSO network by the balancing market. The description of the algorithm and the solution are in Deliverable D10.4. The algorithm is developed as a software solution and a part of the Polish demo market platform.</p> <p>The TSO-DSO coordination algorithm is programmed as a python script, which is used by the atFlex platform to help verify bids added to the platform. It uses bids and grid models as input files and calculates optimal volumes of bids for current grid situation. Due to complexity of development and complexity of the task it is now used only for small areas with low levels of power, so it should be treated</p>

	<p>like an attempt to automatize the whole process of bids verification in a different way.</p> <p>More details can be found in Deliverable 10.4 "Report on demonstration".</p>
Responsible Partner	NCBJ, PSE
Type	Software, Algorithm
Innovativeness introduced compared to already existing Products/Services	Automatized algorithm that considers the most updated information of the DSO network offers and FSP offers
Unique Selling Point USP - Unique Value Proposition UVP	<p>The algorithms allow the balancing market to access cheaper resources from the DSO network without endangering the DSO network.</p> <p>However, it might be applied in the internal DSO systems as a way to automatically perform dynamic grid impact assessment.</p>
"Market" – Customers	<p>Flexibility market owner</p> <p>DSOs</p> <p>TSOs</p>
"Market" - Solution already on the market	Static grid impact assessment by the DSO, which is currently not enough. And therefore, creating a lot of DER curtailments when the DSO network is endangered.
Open Source (yes/no)	No
Exploitation Strategy	<p>To extend the cooperation with the partners of the Polish DEMO in order to deliver the solution in reality, e.g. through different research grants programmes at the national and international level. In addition, we are open for cooperation with other partners.</p> <p>There are several market options for the algorithms: as a part of the flexibility platform (as in the DEMO included in the atFlex platform) or as an internal part of the DSO dynamic grid assessment. The first application depends on the evolution of the regulation and flexibility markets in Poland.</p>
TRL before the project	2
TRL after the project	7
Minimum TRL required by GA	6 (demonstrating OneNet Innovation pillars to TRL minimally from level 6 to 8 validated through field trials)

4.4 Network traffic light system

Name:	Network traffic light system
Description	The network traffic light is IT platform on central level enables the DSOs to signal aggregators and flexibility providers whether they are/will be able or not to provide flexibility at a particular point in time. The solution also

	<p>provides additional information from aggregators and FSPs to DSO regarding the amount of contracted services and cleared bids before real activation.</p> <p>Both solutions (traffic light system and platform – see the section below) are based on flexibility register, which contains list of FSP units and several additional information about each unit (installed capacity, ID code, aggregation block, etc.).</p> <p>Details on the Czech demo including the traffic light system is provided in the Deliverable 10.1 "Report on Customer Engagement" as well as in Deliverable 10.4 "Report on demonstration".</p>
Responsible Partner	ČEZ Distribuce, EG.D, ČEPS, Unicorn
Type	Software
Innovativeness introduced compared to already existing Products/Services	<p>So far there has not been a central point in Czechia that provides up to date information on network outages – in terms of data access and clarity, it is a substantial improvement of the market environment for all participants.</p> <p>With this solution in place. All market participants will have access to updated data on grid availability and can plan the delivery of flexibility accordingly.</p> <p>As far as the new market platform is concerned, it is supposed to provide know-how and insight into how the new market for non-frequency flexibility can be organized.</p>
Unique Selling Point USP - Unique Value Proposition UVP	Since the traffic light scheme is “operational” now, we expect measurable benefits for market participants (aggregators) in terms of more clarity considering duration and scope of outages so they can better organize their business activities. It will also decrease administrative burden for all parties.
"Market" – Customers	Aggregators, DSOs and TSOs
"Market" - Solution already on the market	Prior to the project there was no dedicated solution available.
Open Source (yes/no)	No
Licensing	SaaS
Exploitation Strategy	<p>Network traffic light concept is in real life operation in CZ right now, all FSP connected to DS network using it for current grid conditions and provide flexibility services based on that information.</p> <p>The traffic light scheme has already been implemented as a nationwide solution through a new policy. It has become mandatory for all generators and consumers of 0,5MW or above as of January 2022. –The solution also introduced appropriate data exchange standards allowing clear communication of important grid events (outages/planned outages) to relevant parties. In the future it will also become part of new Energy Law as a regular policy.</p> <p>Lessons learned from market platform design will be used in business specification for a new robust central national system for data exchange, currently in preparation in CZ.</p>

	<p>There is substantial involvement of IT provider Unicorn, SOs (system operators) were engaged in design and testing of the whole solution.</p> <p>All debated solutions will contribute to better interaction between SOs (TSO and DSO) and new market participants – i.e. aggregators.</p>
TRL before the project	5
TRL after the project	8
TRL required by GA	8

4.5 TSO-DSO coordination scheme ('traffic light')

Name:	TSO-DSO coordination scheme ('traffic light')
Description	<p>The reason for establishing communication between the DSOs and TSO stems from the conflict of interest of certain assets. Issues can be induced between TSO and DSO as the direction of asset dispatch is opposing, in other words there can be a conflict of interest between the frequency of non-frequency-based dispatches of an asset.</p> <p>To coordinate the procurement of flexibility resources between TSO and DSOs, a 'traffic light' scheme and a supportive data exchange model was elaborated.</p>
Responsible Partner	BME
Type	Algorithm
Main Impact Domain	Regulation
Innovativeness introduced compared to already existing Products/Services	The TSO-DSO coordination scheme developed in the OneNet project is the first of its kind in Hungary, as DSOs were not competing for the same flexibility resources before.
Unique Selling Point USP - Unique Value Proposition UVP	The coordination scheme prevents the TSO and the DSOs from activating the same bids on competing markets (flexibility and balancing), thus maximizing the potential of technical capabilities of FSPs.
"Market" – Customers	TSO, DSOs, FSPs
"Market" - Solution already on the market	There is no such solution on the (Hungarian) market
Open Source (yes/no)	NA
Access and Support	<p>The TSO-DSO coordination scheme was published in Chapter 5.2.2. of Deliverable D10.4.</p> <p>The uptake of the results is ensured by the 'Flexibility Subcommittee' of the 'Distribution Rules Committee', formed by representatives of the TSO, the DSOs and the Regulator.</p>
Exploitation Strategy	The TSO – DSO coordination method will be included in the form of new policies in the respective network codes.
TRL before the project	1

TRL after the project	7
-----------------------	---

4.6 FSP accreditation methodology (Flexibility register)

Name:	FSP accreditation methodology (Flexibility Register)
Description	The register that stores the capabilities, type, and data required for utilizing the flexibility of FSPs
Responsible Partner	BME
Type	Methodology
Innovativeness introduced compared to already existing Products/Services	The FSP accreditation methodology and the structure of the flexibility register developed in the OneNet project is the first of its kind in Hungary, as DSOs were not procuring flexibility resources before.
Unique Selling Point USP - Unique Value Proposition UVP	It is a method and process description that enables the MO to carry out accreditation of FSPs to enter the market and keep track of their abilities.
"Market" – Customers	DSOs, FSPs.
"Market" - Solution already on the market	There is no such solution on the (Hungarian) market
Open Source (yes/no)	NA
Exploitation Strategy	The flexibility register was implemented in the flexibility platform of E.ON during the project, so that the platform relies on the data stored in the register when creating the merit order list of bids. (E.g. an FSP that has a so-called non-guaranteed connection, will be cleared first, regardless of market-based bids.)
TRL before the project	1
TRL after the project	8

4.7 Harmonized market products

Name:	Harmonized market products
Description	Northern cluster proposes a set of flexibility products for different time horizons (long-term, short-term, near-real-time), to be used simultaneously for different needs, and is applicable to different countries. Please refer to OneNet D7.3 "Report on market functionality", which will describe the products.
Responsible Partner	TSOs (AST, Elering, Fingrid, Litgrid) and DSOs (Elektrilevi, ESO, ST, KSOY-V) of Northern cluster
Type	Other
Main Impact Domain	Policy

Innovativeness introduced compared to already existing Products/Services	One harmonized product can be used simultaneously for different needs (frequency and congestion management) by different buyers (TSO and DSO).
Unique Selling Point USP - Unique Value Proposition UVP	Harmonized products facilitate increased liquidity in the market whereby an FSP is not forced to decide for which purpose to offer its flexibility. The description of a product is universal enough for using it in different countries.
"Market" – Customers	System operators, FSPs, market operators
"Market" - Solution already on the market	Many Horizon projects propose different approaches to product definitions.
Open Source (yes/no)	NA
Exploitation Strategy	<p>Has been communicated to the stakeholders of concerned countries, mostly via dedicated events (public event OneNet, GRIFOn workshop with BRIDGE Community). The results will be considered for further exploitation by the system operators and discussed with national regulators and ministries, potentially leading to, if needed, guidance and additional legislation. In particular for the ongoing discussions with respect to the Network Code for Demand Side Flexibility, the results are relevant and will be shared with involved system operators and policy makers. See also section 4.17 “Framework for system services, products and harmonisation of products”.</p> <p>Initial discussions among interested TSOs and DSOs are the first step towards implementing a real-life coordinated flexibility uptake initiative that can use one or more of the demonstrated working components of the Northern demonstrator. Once committed to collaborate, discussions can then be undertaken to implement the specific needs of the specific region and make use of the product structures, coordination capabilities etc...</p>
TRL before the project	6
TRL after the project	8
TRL required by GA	Relates to Innovation Pillar 2: Moving from system-centric to consumer-centric approach. TRL minimally from level 6 to 8

4.8 Recommendations for Market Designs

Name:	Recommendations for Market Designs
Description	<p>Policy recommendations on how to remove existing barriers to move from markets (energy and flexibility) in isolation to integrated and coordinated markets.</p> <ul style="list-style-type: none"> ➤ The recommendations are consumer centric. ➤ The recommendations are in support of the new Framework Guideline on Demand Response/amendment to existing network codes. ➤ The recommendations include 1) a definition what OneNet considers as integrated markets 2) an assessment of existing barriers to achieve integrated markets 3) a set of solution spaces that propose how barriers should be removed.

	The analysis combines R&D executed in T3.1, T3.2 and T3.4 of OneNet and is part of the Market Design part of D11.7 "EU wide implementation of market schemes and interoperable platforms".
Responsible Partner	VITO, Comillas
Type	White Paper
Main Impact Domain	Policy, to a lesser extent Society
Innovativeness introduced compared to already existing Products/Services	<p>1) Current analysis and recommendations for TSO-DSO coordination were focusing on the regulated side (i.e. the coordination aspect between system operators - - our recommendations add the perspective of the non-regulated side)</p> <p>2) Recommendations take a European approach using a combination of top research – supported by the largest group of demonstrators – to propose a unified vision (combination of R&D and demonstrators at such a large scale is unique)</p>
Unique Selling Point USP - Unique Value Proposition UVP	The recommendations stem from a very large set of partners and recommendations and are supported by sound modelling (see other WP3 KER for details on the modelling support)
"Market" – Customers	<p>The development will set the stage for additional research in future Horizon Europe projects. In addition, some customers of interest are listed below:</p> <ul style="list-style-type: none"> • Scientific community • System operators (both TSOs and DSOs). • Market operators • Regulators • Local/regional/national authorities and other public bodies • EU policy makers • EU citizen and consumer organisations <p>In particular, Recommendation on Market designs should serve as an input for the upcoming Network Code on Demand Side Flexibility (ACER – EC – TSOs and DSOs).</p>
"Market" - Solution already on the market	Recommendations on market design exist, but the OneNet perspective (R&D meets demonstrators at large scale) is unique
Open Source (yes/no)	NA
Exploitation Strategy	<ul style="list-style-type: none"> • Workshops (GRIFOn) – during preparation phase • Public consultation • Workshops for communication results (in coordination with roadmap task) • Living Document – position paper to be published as separate document • Publications • Interactions with policy makers
TRL before the project	4
TRL after the project	7
TRL required by GA	6-8

4.9 Coordinated TSO-DSO Flexibility Market Simulator and Market Clearing Module

Name:	Coordinated TSO-DSO Flexibility Market Simulator and Market Clearing Module
Description	<p>Simulation environment of TSO-DSO coordinated flexibility market models and clearing mechanisms.</p> <ol style="list-style-type: none"> 1. Presents several flexibility market models (based on different TSO-DSO coordination schemes, namely: common market, fragmented market, disjoint market, local market, and several multi-level sequential markets) 2. Receives as input: the set of flexibility bids submitted and their technical requirements, the system operators' network representation (e.g., network topology, base generation/load and/or base flows profiles) and the system operator's' flexibility needs 3. Outputs the market clearing results, including: the portion of each bid to be cleared/purchased, resulting market prices, total flexibility procurement costs, updated network state after market clearing, etc. <p>The market clearing mechanism (for each TSO-DSO coordinated market model) ensures the flexibility needs of the system operators are met at the minimum possible cost while abiding by the grid constraints of all the systems involved, as well as the technical constraints of the bids.</p>
Responsible Partner	VITO
Type	Simulation environment and mathematical modeling tool
Main Impact Domain	Policy, to a lesser extent Commercial
Innovativeness introduced compared to already existing Products/Services	Enables the simulation and analysis of different TSO-DSO coordinated market models – based on well-founded optimization models and techniques – which is a novel scope and mechanism (scientifically and in practice). In addition, the developed product can also be used as a market clearing engine itself (when the input data needs and specifications are met)
Unique Selling Point USP - Unique Value Proposition UVP	Enables the analysis of the efficiency of different types of TSO-DSO coordinated market models and this efficiency's sensitivity to a wide range of inputs. The simulator also enables testing the market clearing engine itself for different TSO-DSO coordinated settings. This enables system and market operators to define the most suitable TSO-DSO market design and market clearing model for their particular use case. In addition, the simulator enables FSPs to test bidding strategies and the general impact of their participation in the market, in which an FSP can estimate its possible revenue under a certain bidding scheme for a certain flexibility market model.
"Market" – Customers	<p>The development will set the stage for additional research in future Horizon Europe projects. In addition, some customers of interest are listed below:</p> <ul style="list-style-type: none"> • Scientific community • System operators (both TSOs and DSOs). • Market operators • Regulators

	<ul style="list-style-type: none"> Local/regional/national authorities and other public bodies EU policy makers EU citizen and consumer organisations Aggregators/FSPs
"Market" - Solution already on the market	Market simulators (as far as we know, none of them offer TSO-DSO coordinated flexibility market models – where available simulators primary focus on wholesale and ancillary services markets). However, market exploration would be conducted once the product gains additional maturity. The main scope at the moment has been scientific development, proof of concept, and validation through testing on different use cases.
Open Source (yes/no)	no
Exploitation Strategy	<ol style="list-style-type: none"> Scientific publications. The development here will also set the stage for additional research and development in future research projects. Showcase the functionality to potential customers through workshops, public deliverables, and position and scientific papers. Receive feedback on perceived value followed by an adaptation to the functionality Improve the functionality based on received feedback and move forward from the current research stage to a more mature product development stage (which can potentially deliver value directly to the customers – beyond the scientific community) <ul style="list-style-type: none"> relevant scientific publications (peer -reviewed)
TRL before the project	TRL 3-4
TRL after the project	TRL 4-5

4.10 OneNet KPIs repository

Name:	OneNet KPIs repository
Description	This KER is a list of KPIs including their characterization, definition and calculation formula.
Responsible Partner	UBE
Type	Open Dataset
Main Impact Domain	Policy
Innovativeness introduced compared to already existing Products/Services	Given the high number of demos participating in the OneNet project and the variety of KPIs defined within the project, this list is quite extensive compared to the existing ones covering KPIs from market operation and grid operation to data management focusing on the topic of flexibility provision.
Unique Selling Point USP - Unique Value Proposition UVP	Researchers on the topic of flexibility markets and research departments of TSOs and DSOs will be able to find in an easy way the KPIs they need to benchmark the process of their own research activities.

"Market" – Customers	<ul style="list-style-type: none"> scientific community DSOs, TSOs technology providers
"Market" - Solution already on the market	Other EU research projects (CoordiNet, EUniversal, EU-SysFlex, InterFlex, SmartNet) have defined KPIs related to flexibility and TSO-DSO-FSP coordination.
Open Source (yes/no)	NA
Exploitation Strategy	<p>Publications, direct scientific use.</p> <p>The channel that will be used to reach the targeted stakeholders is through open data platforms such as Zenodo and through publications.</p> <p>Create a document/excel with the KPIs used in OneNet including their definition and categorization and upload it to Zenodo. The intention is to provide an easily accessible list of metrics in other projects testing similar use cases with OneNet.</p>
TRL before the project	TRL 4
TRL after the project	TRL 8

4.11 Definition and analysis of Business Models for OneNet BUCs

Name:	Definition and analysis of Business Models for OneNet BUCs
Description	For each of the BUCs in the OneNet project, the Business Models (BM) specifications are defined focusing on one of the system roles involved in the BUC. Reported in OneNet Deliverable 11.6 . The BM are defined and described, including aspects like the definition of the value provided by the service or product to be delivered, its main customers, the relationships among the several stakeholders involved in the implementation of the BM, the channels to be used to reach the customers, or the main sources of revenues and expenses resulting from the implementation of this BM. Together with this, the role to be played by each main system stakeholder in all the BMs that are focused on it were compared. Lastly, an assessment of the level of engagement of the key stakeholders involved in the implementation of the BM will be carried out, and based on this, some measures to implement to increase the level of engagement of those key stakeholders that have a low level of interest in the implementation of the BM are proposed.
Responsible Partner	Comillas
Type	Other
Innovativeness introduced compared to already existing Products/Services	A proper BM has not been defined and assessed before OneNet for the deployment of the specific services targeted by each of the BUCs in the OneNet project in the regional/country context of each BUC. Thus, this involves the novel application of already existing BM definition and assessment methodologies to the specific case of the BUCs in the OneNet project.
Unique Selling Point USP - Unique Value Proposition UVP	The regulatory authorities will be able to use the BM definition and assessment carried out here to implement regulatory changes to enable/facilitate the development of the services targeted by the corresponding BUCs. The main system stakeholders involved in the deployment of these services will also

	benefit from this BM definition and assessment exercise by learning the framework developed for the deployment of the corresponding service and the reasons for the regulatory changes triggered by it, aimed at the implementation of the targeted services.
"Market" – Customers	<ul style="list-style-type: none"> Regulatory Authorities System stakeholders (TSO, DSO, Market Operators, FSPs, Aggregators, etc.) Researchers Industry
"Market" - Solution already on the market	The academic community, regulatory authorities and policy institutions have developed previously similar proposals to drive the implementation of certain services in electricity markets.
Open Source (yes/no)	NA
Exploitation Strategy	<p>New policies are to be developed driving the implementation of the services according to the BM defined in this result. Key stakeholders will get familiar with the aim of the implementation of these policies by getting access to the definition and assessment of the relevant BMs.</p> <p>The regulatory authorities and system stakeholders will learn about our BM proposal by publishing it in our relevant internet repository sites and explaining the implementation of this in Workshops, Meetings, and other relevant fora.</p> <p>Resources needed include proper internet repositories and access to the relevant for a for dissemination of our proposal.</p> <p>Action WP13: ask demos to specify which BMs will be exploited after the project ends</p>
TRL before the project	TRL2: Concept level.
TRL after the project	TRL6: (technology demonstrated in relevant environment) Specific policies should be derived based on the recommendations within the BM definition and assessment carried out in this result.
TRL required by GA	Innovative business models relates to Innovation Pillar 2: Moving from system-centric to consumer-centric approach. Required TRL minimally from level 6 to 8

4.12 Strategies for customer engagement in the provision of system services

Name:	Strategies for customer engagement in the provision of system services
Description	For the main categories of customers involved in the OneNet project and the use cases that will be analysed in depth, 'standardised' engagement strategies will be provided in the corresponding deliverable. The results will be reported in OneNet Deliverable 11.6. The strategies will be defined and described according to the category of customer of interest and the value (monetary and non-monetary) provided to different stakeholders.
Responsible Partner	EUI
Type	Other: Findings from a literature review with inputs from the demos
Main Impact Domain	Commercial, Societal, Policy

Innovativeness introduced compared to already existing Products/Services	Customer engagement has been overlooked in the development of markets for system services in the electricity sector. While theoretical discussion of the matter is not new, available strategies to address and solve the issue are usually untested. The strategies proposed by OneNet are innovative because they rely, to the largest possible extent, on demos' experience and extensive discussion with a plurality of sector' stakeholders and leading research institutions.
Unique Selling Point USP - Unique Value Proposition UVP	Stakeholders involved in the implementation of customer engagement strategies will have a reference model to implement the most effective strategy according to the category of customer considered. Main values are expressed in terms of time-saving and cost-saving for stakeholders which want to engage customers, compared to a scenario where these strategies have not been formulated.
"Market" – Customers	<ul style="list-style-type: none"> • Energy communities • Electricity system operators • National regulatory authorities and policy makers • Aggregators and citizens • Researchers
"Market" - Solution already on the market	The academic community, regulatory authorities, policy institutions and new players on electricity markets (e.g. aggregator, FSPs) have developed previously similar proposals to drive the implementation of certain services in electricity markets. However, so far, customer engagement has been very limited.
Open Source (yes/no)	NA
Exploitation Strategy	<p>New policies are to be developed as in the Network Code for Demand Side Flexibility in order to create a favourable environment where stakeholders like aggregators, FSPs and energy companies can implement the aforementioned strategies.</p> <p>Since the KER is a piece of knowledge, the plan is to promote its penetration in the “market”, by giving visibility to it online and offline. We will do this online via publications and other multimedia contents, such as videos or podcasts, that will remain accessible in the project website and in permanent repositories such as Cadmus at the EUI. We will do this offline and via presentations during conferences and trainings for people working in the sector.</p>
TRL before the project	4 (technology validated in laboratory)
TRL after the project	6 (technology demonstrated in relevant environment)

4.13 Methodology for market architecture harmonization analysis

Name:	Methodology for market architecture harmonization analysis
Description	This KER is a methodology to assess the market harmonization potential and barriers presented in OneNet Deliverable 11.2 .
Responsible Partner	Comillas
Type	Methodology

Main Impact Domain	Policy
Innovativeness introduced compared to already existing Products/Services	The proposed methodology is original since it does not consider the markets in a market architecture as standalone entities but pursues their coordinated functioning. Markets can cooperate by using the same pool of resources if they are harmonised (i.e. if they have the same design characteristics). Bid forwarding between markets is a means of coordination as it allows resources to be allocated between them, thereby creating value for market participants. The methodology supports market design by analyzing the potential and barriers to harmonizing the market architecture.
Unique Selling Point USP - Unique Value Proposition UVP	Researchers on markets integration, Regulators, and research departments of Market Operators, TSOs and DSOs to analyze and design market-based TSO-DSO-Customer coordination to enhance market participation and value staking.
"Market" – Customers	<ul style="list-style-type: none"> • Scientific community • Regulatory bodies and public authorities • MOs, DSOs, TSOs • Aggregators, consumers, energy communities, FSP
"Market" - Solution already on the market	Other EU research projects (CoordiNet, SmartNet) have addressed the market-based coordination of the TSO-DSO-Customer chain.
Open Source (yes/no)	NA
Exploitation Strategy	Publications, direct scientific use New Policy recommendations use in classes and future projects.
TRL before the project	4
TRL after the project	8

4.14 Methodology for market phase harmonization analysis

Name:	Methodology for market phase harmonization analysis
Description	This KER is a methodology to assess the market phases' harmonization potential and barriers presented in OneNet Deliverable 11.2 .
Responsible Partner	Comillas
Type	Methodology
Main Impact Domain	Policy
Innovativeness introduced compared to already existing Products/Services	The proposed methodology is original since it decouples the markets in their elementary phases. The assessment checks for potential and barriers to harmonize the processes among the market phases, the underlining assumption is that the highest level of commonalities among market phases leads to an increased overall market functioning efficiency. The methodology allows for formulating recommendations to design harmonized market phases.

Unique Selling Point USP - Unique Value Proposition UVP	Researchers on markets integration, Regulators, and research departments of Market Operators, TSOs and DSOs to analyze and design market-based TSO-DSO-Customer coordination to enhance market participation and value staking.
"Market" – Customers	<ul style="list-style-type: none"> • Scientific community • Regulatory bodies and public authorities • MOs, DSOs, TSOs • Aggregators, consumers, energy communities, FSP
"Market" - Solution already on the market	Other EU research projects (CoordiNet, INTERRFACE, EU-SysFlex, SmartNet) and other initiatives (Active System Management report ⁷ , Universal Smart Energy Framework (USEF) ⁸) have addressed the topic of market-based coordination of TSO-DSO-Customer chain and the corresponding market-phases.
Open Source (yes/no)	NA
Exploitation Strategy	Publications, direct scientific use New Policy recommendations Use in classes and future projects
TRL before the project	4
TRL after the project	8

4.15 Interoperability Key Document

Name:	Interoperability key document
Description	Recommendations on interoperability platforms and data exchange for TSO-DSO-customer coordination. See OneNet Deliverables 11.3 and 11.7 .
Responsible Partner	E-REDES
Type	White Paper
Main Impact Domain	Policy and commercial
Innovativeness introduced compared to already existing Products/Services	Complete recommendations on interoperability aspects for achieving TSO-DSO-customer coordination. Before some partial recommendations were provided. Thanks to the wide range of demonstrators in OneNet the recommendations cover a wide range of solutions.
Unique Selling Point USP - Unique Value Proposition UVP	Wide range of recommendations on interoperability best practices
"Market" – Customers	Standards Bodies, Regulators, policy makers, public authorities, TSO, DSO, MO, aggregators, customers, energy communities, citizens, FSPs, industry, researchers
"Market" - Solution already on the market	Disperse recommendations on previous projects
Open Source (yes/no)	NA
Licencing	NA
Exploitation Strategy	Publications, direct scientific use

⁷ The TSO–DSO Report on An Integrated Approach to Active System Management is a report written by ENTSOE and four DSO organisations, namely Cedec, E.DSO, Eurelectric and Geode.

⁸ SP Energy Networks, "Project FUSION – GB Reference Implementation of USEF," 2020

	New Policy recommendations Use in classes and future projects
TRL before the project	NA
TRL after the project	NA

4.16 Quantification of BMs' potential

Name:	Quantification of BMs' potential
Description	Quantitative analysis for the considered business models at the European level. See Deliverable 11.6 "Business model analysis of OneNet solutions "for details. This relates also with BMs methodology presented in Section 4.11.
Responsible Partner	Comillas
Type	Methodology
Main Impact Domain	Policy
Innovativeness introduced compared to already existing Products/Services	Quantifications are only partial to represent specific benefits
Unique Selling Point USP - Unique Value Proposition UVP	Quantification of the economic potential of OneNet business models
"Market" – Customers	Policymakers, public bodies, TSOs, TSOs, FSPs, MOs, energy communities, citizens, researchers, industry
"Market" - Solution already on the market	Different studies have quantified the business models potential but partially without considering the full assessment of costs and benefits
Open Source (yes/no)	NA
Exploitation Strategy	Publications, direct scientific use New Policy recommendations Use in classes and future projects
TRL before the project	6
TRL after the project	8
TRL required by GA	8 (Innovative business models relates to Innovation Pillar 2: Moving from system-centric to consumer-centric approach. Required TRL minimally from level 6 to 8)

4.17 Framework for system services, products and harmonisation of products

Name:	Framework for system services, products and harmonisation of products
Description	Development of a framework for system services, products and harmonisation of products. The framework allows to classify flexibility products (both existing and novel services) according to a similar classification terminology of possible product attributes. In addition, standardized ranges of values for the listed product attributes are proposed. Finally, a methodology is presented to ensure further harmonization of flexibility products, in particular for novel services. OneNet proposes as a first application of the framework 6 harmonised products that are described according to the OneNet classification, with harmonized

	<p>product values, that can be used for both balancing and congestion management.</p> <p>For more information please refer to Deliverable D2.2 and Deliverable 11.2.</p>
Responsible Partner	VITO
Type	Other
Main Impact Domain	Policy
Innovativeness introduced compared to already existing Products/Services	<p>Using that framework, we developed a number of harmonised products that address the need for common system services exploiting all network resources (balancing and congestion management), which are then mapped against the different services and products demonstrated in the OneNet clusters of demonstrator partners. Harmonised products are products where there is some degree of convergence but at the same time still margin for differentiation between the products. Under this definition, standard products are just one extreme option inside of a spectrum of potential levels of harmonisation (i.e. standardised products are fully harmonised products). To identify the level of potential harmonisation, expected benefits need to be compared with the costs to surpass any harmonisation barrier. In those cases where the benefits surpass the costs, it would be advisable to increase the harmonisation between products.</p> <p>Through framework analysis, we found that products can be split up into two main groups. The first group is the frequency control products group. These products have a larger margin for harmonisation as potentially larger benefits could be achieved by harmonising between bidding zones as they do not require locational information. Furthermore, TSOs have a good understanding of these products as they have been using them for a while which reduces the costs of harmonisation. Our approach is consistent with the current where frequency control products are being harmonised by the TSOs through a number of projects (e.g. PICASSO, MARI, TERRE). As these efforts are already ongoing, we based our own harmonised products on those being developed in these projects.</p> <p>The second group of products is the non-frequency control products group. The need for harmonisation in these products is smaller as they are location-specific, meaning that the main rationale for harmonisation would be to facilitate the interactions between TSO-DSO-consumers by reducing the diversity between products. Furthermore, the potential barriers to harmonisation could also be higher as DSOs have only recently started using / considering some of these products and this could result in harmonised products that do not work for some of the SOs. For this second group of products, an approach with a certain degree of harmonisation was developed to facilitate the coordination between TSO-DSO-customers without attaining full harmonisation. A list of attributes was identified that would allow an FSP to understand whether they can deliver the product, but at the same time allowing a certain degree of variety among the values for some of the product attributes.</p> <p>In the next step, the developed standard products were compared with the products being proposed by the OneNet demonstrators. We found that, among the demonstrator partners, there is a focus on the non-frequency control products, where there is currently less practical experience.</p>

	<p>These harmonised products were also compared against the products that TSOs and DSOs (inside of the project as well as outside) had identified as potential future products. This comparison shows that the harmonised products included all the relevant products identified by the different SOs. Furthermore, as part of that analysis it also became clear that both TSOs and DSOs are considering similar non-frequency products. Therefore, there would appear that consistency between the definition of these products could also facilitate the TSO-DSO coordination as well as the operations of the FSPs as they would only need to identify one set of products instead of separate products for TSOs and DSOs.</p> <p>Finally, in this project we also considered the potential evolution of product design. We identified two extreme evolutions. The first extreme is the supermarket approach where SOs would have the full responsibility to identify the best FSP for their needs at each point in time and the second extreme is the superproduct where FSPs should provide one product that the SO can use to address all its needs. Even if those two extreme approaches are unlikely to arise, potential hybrid options were identified that could facilitate the integration of all different sources of flexibility into the management of the energy systems.</p>
Unique Selling Point USP - Unique Value Proposition UVP	Provides direct input towards the recommendations in upcoming policy documents on product design for non-frequency ancillary services (e.g. congestion management and voltage control) and provides guidelines towards a harmonized EU-setting.
"Market" – Customers	<ul style="list-style-type: none"> • System operators • Market operators • Policy makers • Regulators • Scientific community
"Market" - Solution already on the market	Bibliography and publications.
Open Source (yes/no)	NA
Exploitation Strategy	The proposed classification framework, including definition of product attributes and corresponding values has been shared with regulators, system operators and policy makers. The proposals serve as input for the ongoing discussion of the upcoming Network Code on Demand Side Flexibility. The illustration of the framework and guidelines for harmonisation, with a set of 6 flexibility products for balancing and congestion management serve both for European and national policy makers as example on how a future standardized flexibility product menu could look like.
TRL before the project	NA
TRL after the project	NA

4.18 Business Use Cases and System Use Cases

Name:	Business Use Cases and System Use Cases
-------	---

Description	<p>One of OneNet’s innovation pillars is to create an integrated marketplace for system services by contributing to the construction of the European Internal Market for electricity. OneNet produced a set of Business Use Cases (BUCs) and System Use Cases (SUCs) for all demonstrators in the four clusters (Northern, Southern, Western, Eastern), that will materialize the OneNet products and services. For this, the standardized IEC Use Case methodology was applied, which is based on the IEC 62559 template, in order to enable a common understanding of functionalities, actors and processes across the different demo BUCs.</p> <p>See D2.3: Business Use Cases for the OneNet</p> <p>D5.1: OneNet Concept and Requirements</p> <p>The final versions of the use cases are stored on Zenodo:</p> <p>Use Cases of Spanish Demo in OneNet Project (zenodo.org)</p> <p>Use Cases of French Demo in OneNet Project (zenodo.org)</p> <p>Use Cases of Polish Demo in OneNet Project (zenodo.org)</p> <p>Use Cases of Portuguese Demo in OneNet Project (zenodo.org)</p> <p>Use Cases of Cypriot Demo in OneNet Project (zenodo.org)</p> <p>Use Cases of Greek Demo in OneNet Project (zenodo.org)</p> <p>Use Cases of Slovenian Demo in OneNet Project (zenodo.org)</p> <p>Use Cases of Czech Demo in OneNet Project (zenodo.org)</p> <p>Use Cases of Northern Cluster in OneNet Project (zenodo.org)</p> <p>Use Cases of Hungarian Demo in OneNet Project (zenodo.org)</p> <p>Regional Business Use Cases in OneNet Project (zenodo.org)</p>
Type	Use Case
Innovativeness introduced compared to already existing Products/Services	The cross analysis of the BUCs showed that there is a clear focus on the provision of non-frequency ancillary services, while regarding the type of coordination the number of BUCs considering market-based TSO-DSO coordination, market-based DSO coordination and technical-based TSO-DSO coordination respectively is equally distributed.
Unique Selling Point USP - Unique Value Proposition UVP	Provides valuable insight on the specific domain.
"Market" – Customers	<ul style="list-style-type: none"> • System operators • Market operators • Regulators • Scientific community
Exploitation Strategy	OneNet SUCs, BUCs and Regional BUCs have been published on the Zenodo platform, tagged with the OneNet project number 957739 (in the current

	absence of a BRIDGE Use Case repository). They are freely available for use after OneNet ends.
--	--

4.19 Recommendations for the Harmonised Electricity Role Mode

Name:	Recommendations for the Harmonised Electricity Role Model
Description	<p>Presentation of an overall analysis of all the roles and actors proposed for all the use cases presented in the project demos.</p> <p>For more information please refer to Deliverable D2.5.</p>
Responsible Partner	ENTSO-E
Type	Other
Main Impact Domain	Policy
Innovativeness introduced compared to already existing Products/Services	Analysis presenting the comments from both TSO and DSO point-of-view is presented, to support the continuous improvement of the HERM to integrate more market participants, being aligned with the mandate from European Commission.
Unique Selling Point USP - Unique Value Proposition UVP	Provides valuable insight on the specific domain.
"Market" – Customers	<ul style="list-style-type: none"> • System operators • Market operators • Regulators • Scientific community • Local/regional/national authorities • EU policy makers
"Market" - Solution already on the market	The Harmonized Electricity Role Model is a role model maintained by ENTSO-E, see Role Models . The current latest version of HERM is the 2023-01 version .
Open Source (yes/no)	NA
Exploitation Strategy	HERM is going to be maintained by ENTSO-E and EU DSO entity as part of a joint work that has been established.
TRL before the project	NA
TRL after the project	NA

4.20 Open Datasets

Name:	Open Datasets produced by OneNet
Description	<p>Open datasets produced by OneNet horizontal WPs and demos in the categories:</p> <ul style="list-style-type: none"> ▪ Cross-platform services (categorisation, business subjects, data quality requirements etc. from WP5)

	<ul style="list-style-type: none"> ▪ Grid Data ▪ Metering Data ▪ Market Data ▪ DSO flexibility market data ▪ Resource Data (flexibility service providers information) ▪ Prediction and Planning ▪ Data series used in OneNet Northern demo ▪ Demos KPI values ▪ Use Cases of WP3 ▪ Use Cases of OneNet Northern demo <p>The datasets are described in OneNet D14.1. The datasets are:</p> <p>Dataset to Study Flexibility Service Providers' Gaming Potential and its Impact on TSO-DSO Coordinated Markets</p> <p>Dataset to Study Grid-Secure Use of Distributed Flexibility in Sequential DSO-TSO Markets</p> <p>OneNet - AccessNet (Czech Demo - part e-fleet) - dataset + KPI evaluation Flexibility market results</p> <p>OneNet Cross-Platform Services</p> <p>Dataset to Study Grid-Secure Use of Distributed Flexibility in Sequential DSO-TSO Markets</p> <p>Demo bids for to demonstration areas in OneNet project of the Hungarian demonstration</p> <p>OneNet project - KPIs repository</p> <p>Info about bidding (market data)</p> <p>Activation market document</p> <p>Dataset to Study Flexibility Service Providers' Gaming Potential and its Impact on TSO-DSO Coordinated Markets</p> <p>OneNet project - T9.3 - Spanish demo open data</p> <p>Photovoltaic Generation and Load Demand Datasets with 30 seconds resolution from an Actual Prosumer in Cyprus</p> <p>Real data from PMUs</p> <p>List of business and system roles of Northern Cluster in OneNet project</p> <p>OneNet Portuguese demonstration - Open Data sets</p> <p>Increase of active-power-based flexibility (data for KPI evaluation)</p> <p>CZ DEMO KPIs in OneNet Project</p> <p>System Use Cases of Northern Cluster Demo in OneNet Project</p> <p>List of business and system roles of Northern Cluster in OneNet project</p> <p>List of information objects of Northern Cluster in OneNet project</p> <p>Demo data of Northern Cluster in OneNet project</p> <p>Wind and SOLAR RES predicted production data for Crete and Peloponnese - ONENET WP8</p> <p>Predictions of critical events on OHLs - EUROPE ONENET WP8</p>
Type	Open Dataset
Main Impact Domain	Electrical grid research
Exploitation Strategy	The datasets are published on the Zenodo platform, tagged with the OneNet project number 957739 , and are freely available for use after OneNet ends.



5 Uptake of Solutions by TSOs and DSOs

5.1 Uptake by TSOs

ELES DOO SISTEMSKI OPERATER PRENOSNEGA ELEKTROENERGETSKEGA OMREZJA (ELES)

Building upon the successful use cases conducted in the ONENET project, ELES is committed to extending these initiatives beyond DSO substations to encompass all TSO-DSO interfaces. This expansion aims to enhance awareness and integration of renewable energy sources (RES) across both transmission and distribution network grids in Slovenia.

The lessons learned and best practices established through ONENET project use cases serve as a solid foundation for scaling up RES integration efforts. By leveraging these insights, ELES seeks to optimize the collaboration and coordination between transmission and distribution system operators, ensuring seamless integration of renewable energy resources.

In addition to technical advancements, ELES recognizes the importance of disseminating knowledge and promoting awareness of RES integration strategies. To this end, the company actively participates in various dissemination activities, including international conferences, expert meetings, as well as national events and gatherings in Slovenia.

AKCIJU SABIEDRIBA AUGSTSPRIEGUMA TIKLS (ST)

After the OneNet project AS "Augstsprieguma tīkls" (AST) plans to utilize developed optimization-based market clearing module or, at least, its optimization process, from the Northern Cluster solution, as a potential approach to mitigate complex network congestion situations caused by RES in the close future due to its rapid growth and high penetration. AST has taken first step regarding a national network congestion mitigation approach, but practical implementation and utilization of the optimization process is only planned due to current lack of network congestions.

As it is likely that network congestions will occur, the practical implementation and utilization of the optimization-based market clearing module or, at least, its optimization process, will be necessity. Utilization of this optimization process will involve all market participants with generation units with installed capacity equal or greater than 0,5 MW, which expands a wider range of market participant that might not participate in TSO's balancing markets. However, no flexibility is yet expected to participate due legal barrier, which does not allow independent aggregator operation.

After the OneNet project AST is also prepared to utilize the experience and results of the OneNet project in regard to the upcoming Network Code for Demand Response, introducing Flexibility Register, system operator coordination, product prequalification, among other things. Here OneNet project knowledge base and solutions provide TSO and DSO the first stepping stone on theoretical and practical execution. The implementation of new regulations, once in force, will take the collaborative efforts of the TSO and DSO.

AST intends to disseminate the OneNet project findings to the stakeholders of Latvia to raise awareness of flexibility and new solution developments. Intended as an article published on company's website and organization of a public event.

ELERING AS

The objective of Estonian demonstrator is to increase liquidity and transparency in the flexibility market, thereby enabling more RES connections while avoiding congestions in the grid. This could be achieved through a common marketplace consisting of harmonised set of flexibility products, processes and tools, both on national and regional level.

Regarding balancing, the need is to integrate distributed resources, including demand side, in practice (regulation already allows), at the same time avoiding creation of congestions in the distribution grid. Optimisation algorithm enables to take into account the imbalance position when optimising for the congestion management. Regarding congestion management, adding new RES generation in some areas would cause congestions in certain hours in both distribution and transmission grids creating voltage issues, especially if taking future bookings into account.

The uptake of specific results of OneNet is to be decided by the TSO and major DSO in near future. However, both have identified quite some potential benefits. Common TSO-DSO flexibility register would facilitate the participation of FSPs, including the registering of the flexibility resources and both “product prequalification” and “grid prequalification”.

Direct interaction with the FSPs regarding bid collection is the task of MOs. Currently it is the TSO (for balancing market) but independent market operators would be encouraged to step in also. All MOs forward the bids to the central clearing/optimisation algorithm using CIM compliant message structure. FSPs would be encouraged to use this same structure.

Grid information is needed for optimization and grid qualification. Central optimisation algorithm would enable value-stacking, i.e. optimising the bids from all MOs per product across different needs (balancing, congestion management) and different flexibility buyers (TSO, DSO). Information about cleared bids would be sent from the optimization algorithm back to the concerned MOs. It is the task of the MO to forward the activation request to the FSP, which has the responsibility to activate the resource.

While measurements from both main meters and sub-meters are needed for verification and financial settlement, these data can be provided from the national data hub as well as directly by the FSPs to the Flexibility Register. Flexibility verification would be performed by the flexibility register based on metering data and baselines. FSP can calculate the baseline itself and send it to flexibility register or flexibility register calculates the baseline itself.

FINGRID OYJ

After the OneNet project Fingrid is committed to work towards a flexibility market developed and demonstrated in the project. The concept for TSO-DSO coordination and the interoperability of different marketplaces based on the introduction of standard products and flexibility register was found to be a working target model for the future. Fingrid is also prepared to utilize the results in the implementation of the upcoming Network Code Demand Response, which mandates the introduction of flexibility register and coordination between system operators, among other things.

First steps have already been taken in Finland by Fingrid and DSOs to prepare for a first operational test of a congestion management market. This development stems firmly from the learnings of the OneNet project. The demonstrated flexibility market functionalities, e.g., prequalification, coordination, procurement, verification and settlement are core functionalities in the upcoming flexibility market. One of the main results of OneNet also taken into consideration is the standardization of data models and information exchange. The use-cases demonstrated by Fingrid are the basis for the first real-world implementation of the market.

LITGRID AB

In OneNet, Litgrid AB explored the technical feasibility of NRT-P-E flexibility product for congestion management. While the technical benefits of the product were demonstrated in a segment of the grid, there is a need to analyse the impact for the entire network. For this purpose, Litgrid indicated the need to carry out such a study in the near future. This study should be procured with the task to scale up the demonstration in the transmission grid to identify the flexibility service impact for whole grid and evaluate the economic viability of new flexibility services. The results of the study should consider both TSO and FSP perspective.

The rapid growth of prosumers connected to the DSO grid and new flexibility services (as indicated by Lithuanian DSO – AB Energijos skirstymo operatorius in 0) underscores the need for enhanced TSO-DSO coordination. The OneNet project highlighted the potential benefits of such coordination. The concept of TSO-DSO coordination and marketplace interoperability, based on the introduction of standard products and a flexibility register tested by WP7, emerged as a potential future coordination model. This subject is currently under exploration, and specific measures will be determined by the operators in the near future.

As one of the OneNet outcomes a new expert team in the government was created to update national legislation for flexibility market and aggregation models. The revision of legislation will be done considering the new EU electricity market design and the forthcoming Network Code Demand Response guidelines into account.

DIACHEIRISTIS SYSTIMATOS METAFORAS (CTSO)

During OneNet and especially through the participation in the Cypriot demo, the cooperation of TSOC and DSO/EAC was furtherly enhanced, mainly by jointly addressing the challenges of the network and by adopting new procedures and software/tools. Furthermore, the effective collaboration between the TSOC and DSO in the Cyprus pilot pointed out the indisputable benefits from the operation of the grid as a whole.

TSOC recognized the need for a collaborative platform that will enable the seamless exchange of crucial information for better coordination between the two System Operators. Furthermore, it will be attempted that selected tools or features that are encompassed to the ABCM-T platform will be available for real time operation in a pilot base to the Cyprus Energy Control Centre to enhance the situational awareness of the operators. In example, the real time monitoring of the transmission grid through the use of PMU measurements qualifies as the first tool that will be validated in real time operation at the Energy Control Centre, aiming to be a permanent tool for the operators. Then, additional features and tools will be evaluated and integrated to the existing tools.

As the market operator of the Cyprus electricity market, TSOC will suggest to the regulator the adoption of several new market products soon that were shown through the OneNet demonstration activities that could be beneficial for the grid operation. In this direction, several features from those developed in a pilot base in the Cypriot demo will be proposed to be included in an upcoming market restructure of the architecture of the Cyprus electricity market.

Given the above, TSO Cyprus will adopt the best practices followed to the OneNet Cypriot demo for the effective operation of the Cyprus Power System.

OneNet enabled the TSOC to consider refinement in the regulations and policies, aiming to enhance the flexibility of the Cyprus power system. However, due to legal barriers and existing regulations, as well as interoperability issues between the developed platforms and the legacy (existing) systems at the TSOC control centre not all the OneNet results will be directly applied.

In any case, the major goal of the OneNet project, which was the collaboration of the two System operators was achieved. Currently, personnel of the two Operators are already working together in working groups for selected studies or projects and the TSOC-DSO protocol of mutual understanding and collaboration is agreed and signed.

RTE RESEAU DE TRANSPORT D'ELECTRICITE

- The compensation process for curtailment activation will be industrialized although the STAR platform is only running in experimental phase and will not be scaled. The defined standardized data model and internal REXs will be reused in following projects tackling the optimization of flexibilities activation monitoring, not the blockchain technology.
- Open-source release of STAR platform code and instructions under Apache 2.0 license : <https://github.com/rte-france/star>.
- Use of the TSO/DSO coordination study as a starting point for possible future collaboration between RTE and Enedis.

ČEPS, a.s.

Following the completion of OneNet, ČEPS intends to continue to operate and maintain (together with the 3 Czech DSOs) the Network Traffic Light scheme developed in the project and subsequently rolled out into real operation. The Traffic Light system is planned to be operated in this form until such time that the scheme will be incorporated into a centralized energy data management solution (EDC) that is currently being developed in the Czech Republic. Its completion is expected in 2026.

POLSKIE SIECI ELEKTROENERGETYCZNE SPOLKA AKCYJNA

PSE experts who participated in OneNet are involved in preparation of planned EU legislation on flexibility (Network Code of Demand Response). The draft is currently under preparation by joined EU DSO Entity and ENTSO-E Development Team with active PSE participation. Lessons learned from developing algorithms, flexibility register, data requirements, product and grid prequalification are highly important and priceless. Many of those are reflected in current draft of this Network Code.

Regardless of EU activity Polish government implemented Directive 2019/944 to national Energy Law. Further national implementing act are still pending. Nevertheless experience gained from OneNet is consider useful for operationalization of those legal acts, assuming that legislation will allow to use tools and experiences developed in OneNet.

In terms of the use of products created as part of the OneNet project, it is expected that the experience from the development and operation of the atFlex flexibility platform is foreseen to be used in the implementation of the national flexibility register platform referred to in the draft of the Network Code on Demand Response. The solutions used in the atFlex platform in the field of local market operation might be used by the local market operator(s) when this/these market(s) is/are created. Regarding the "TSO-DSO coordination algorithm", it is expected that an approach on how to implement such algorithms might be developed in consultation with

national DSOs. The following solutions will be analysed: central ones based on the AGNO algorithm or distributed solutions in which the AGNO algorithm for DGIA would be implemented at individual DSOs.

MAVIR MAGYAR VILLAMOSENERGIAIPARI ATVITELI RENDSZERIRANYITO ZARTKORUEN MUKODO RESZVENYTARSASAG

MAVIR has started a TSO-DSO project to develop the framework of harmonised usage of different flexibility services. We are focusing those products, what are useful for solving voltage problems and temporary system bottlenecks. The main scope of this project is to define products, managing accreditation, harmonising market rules and timing of different markets, defining TSO-DSO data exchange, etc. MAVIR intends to use several outcomes of OneNet project during this work such as traffic light concept, product definition / market design recommendations and KPIs.

We have already implemented into our local framework a modified version of the traffic light concept (developed in OneNet). Using this idea, we are able to efficiently manage those situations, where a TSO-DSO concurrence is occurred. The typical use case is, when TSO and DSO would like to use same BSP/FSP services at the same time. This solution – based on daily data exchange – allows us to avoid making balancing services impossible, because this method provides priority for TSO (for using certain units) in case of shortage of balancing resources. We are engaged to further develop this concept based on results of OneNet.

5.2 Uptake by DSOs

AB ENERGIJOS SKIRSTYMO OPERATORIUS (ESO)

Energijos skirstymo operatorius AB (ESO) has already integrated some knowledge acquired through the OneNet project into operations in Lithuania. A notable accomplishment is the incorporation of long-term power capacity/energy flexibility product into our flexibility procurement rules. This integration has been officially approved by the national regulatory authority, enabling ESO to engage in real-life procurement of this flexibility product. ESO is planning to further apply the knowledge gained from the OneNet project. The areas of consideration are FSPs enabling, the coordination of flexibility procurements and activations between distribution and transmission operators, flexibility register.

ESO also intends to broaden the dissemination of the OneNet project's findings to stakeholders in Lithuania and enhance awareness about flexibility. To achieve this goal, ESO has established an informational page on the company's website and intends to expand outreach to additional interested market participants through the organization and participation in various flexibility-related events.

AKCIJU SABIEDRIBA SADALES TIKLS (ST)

Sadales tikls has engaged local stakeholders to present the OneNet project results and involve them in the next steps of flexibility market upscaling in Latvia. Strong focus is on improving planning methodology and building short-term congestion forecasting capabilities as enablers for flexibility purchases. Sadales Tikls uses the concepts and Demo results in any conversation with flexibility service providers, aggregators, and the Regulator.

DIACHEIRISTIS ELLINIKOU DIKTYOU DIANOMIS ELEKTRIKIS ENERGEIAS AE (HEDNO)

In our pursuit of an impactful exploitation plan, HEDNO's primary objective revolves around introducing flexibility within the power distribution network. This entails the deployment of cutting-edge technologies and the application of acquired knowledge to optimize network operations. HEDNO is committed to analyse demonstrator results, evaluating their feasibility for scaling up and addressing the challenges and opportunities that arise. Simultaneously, HEDNO will forge strong connections with power systems stakeholders across various European countries, fostering collaboration and knowledge exchange. Our strategy also includes establishing links with external bodies such as associations, technology providers, and manufacturers to broaden the project's impact.

F-channel forecasting module can be exploited from HEDNO as a tool in order to estimate both the flexibility needs of the distribution network as well as the potential for flexibility of distributed resources. HEDNO will use F-Channel as a base to future implementations aiming to prevent distribution grid overloading, increase its resilience and reliability and optimize network planning and operations.

The dissemination plan of HEDNO includes showcasing the project's achievements through presentations of demos to power systems stakeholders, offering insights into the practical applications of our innovations. Additionally, HEDNO will actively participate in events dedicated to innovation actions, presenting its accomplishments and insights to relevant bodies. To ensure a broad reach, HEDNO will regularly update its website and engage with the audience through social media platforms, disseminating the latest news on project developments. Participation in international conferences and workshops will further amplify the project's progress, providing a platform for sharing insights, gaining feedback, and fostering collaborative opportunities on a global scale.

I-DE REDES ELECTRICAS INTELIGENTESSA (I-DE)

The project's results will directly feed the shaping of upcoming policy by participating in further innovation projects and sandboxes regarding flexibility local markets, in which i-DE will be participating along with the other Spanish DSOs

Regulatory rules have to be defined before establishing the new DSO flexibility local markets in Spain to enable the use of flexibility services. The acquired experience in OneNet project will serve as guidance for the existing regulatory barriers. I-DE is now in a better position to understand what the real needs are to help setting up the new flexibility framework through regulatory proposals.

UFD DISTRIBUCION ELECTRICIDAD SA

OneNet experience has been a first immersion in flexibility markets in a more realistic way, performing real market transactions and understanding the behaviour of future FSPs. In UFD, we are thinking about taking next steps to continue the work done in OneNet, and proposing sandboxes in order to continue flexibility markets tests. The Spanish Regulation must be evolved in order to include this strategy as an additional option for DSOs to solve network congestion problems. With the experience gained in OneNet, UFD is better prepared to give influence in this standardization of flexibility markets in Spain.

ENEDIS

- Innovation Enedis Event so called “Forum Enedis innov” : STAR demo presentation to our partners.
- Dedicated presentation with key partners (French DSO, producers, E-DSO etc)
- STAR demo is used to define the back office of curtailment activation process: Part of the process had been implemented in Enedis information system with a traditional technology.

ENERGA OPERATOR SA

Regulatory barriers in Polish law regarding the possibility of using flexibility services by DSOs limit the possibility of direct use of the results from the OneNet project.

EOP will use the experience and results of work with the project to spread knowledge about the market possibilities of using flexibility to support DSOs and to start discussions in Poland with other DSOs and TSOs on the development of the flexibility market for DSOs in Poland. EOP will strive to continue working on flexibility services in subsequent research projects and develop the solutions developed within the project.

CEZ DISTRIBUCE AS

The Czech demo has used part of tested solution (as elaborated in the Deliverable D10.4) for the real operation. It is the traffic light scheme which, with some additional upgrades, is in place as communication interface allowing market participants to have information on availability of the distribution grid for activation of the flexibility. The second part of the pilot was on non-frequency services – IT platform as such will not be

used, as neither the regulatory nor market environment is fit for implementation. On the other hand, market design and service definition will be incorporated in the coming update of regulatory schemes.

ELEKTRO CELJE D.D. (EC)

Elektro Celje, a Slovenian distribution system operator (DSO), is developing a local flexibility market platform to procure flexibility services from end-users. The platform will be developed based on the results of the OneNet project. The platform will enable Elektro Celje to purchase flexibility services from end-users with large electricity consumption, such as those who own heat pumps, EV chargers, and battery storage systems. These services will be used to reduce peak loads on MV/LV transformers and to mitigate voltage issues caused by the high penetration of energy from small photovoltaic (PV) power plants.

The platform will also enable end-users to participate in the flexibility market and earn revenue for providing flexibility services. This will help to create a more efficient and resilient electricity grid, and it will also help to decarbonize the energy system.

ELEKTRO GORENJSKA PODJETJE ZA DISTRIBUCIJO ELEKTRICNE ENERGIJE DD (EG)

Elektro Gorenjska is already active in the field of researching and developing local flexibility platforms and markets, allowing a set group of consumers to participate in the active development. Results provided by the OneNet project will supply Elektro Gorenjska with additional key information and data, allowing further development of the flexibility platform, which will handle the over/undervoltage peaks. As such, it will allow the distribution network to host significantly more heat pumps, chargers for electric vehicles, PVs and storage devices. Goal is for users to be active (or passive) participants in the flexibility market where they will voluntarily allow their power consumption or production to be used for the execution of the flexibility potential, mainly for voltage regulation purposes, but also congestion management.

The participation of active customers will be compensated in a manner which both parties will agree on. That way they will directly contribute towards the goals of green transition and decarbonisation on a local and also on a global network level.

ELEKTRO LJUBLJANA PODJETJE ZADISTRIBUCIJO ELEKTRICNE ENERGIJE D.D. (EL)

Elektro Ljubljana is already using a developed local flexibility market platform for the procurement of flexibility. Flexibility market platform is used to solve overloaded MV/LV transformers. Meaning that the majority of flexible providers are households with higher consumption, such as heating pumps, and households

with battery storage. Since the flexibility market is implemented in the national metering data hub, the DSOs, which are not partners of the OneNet project, will easily connect to the flexibility market, and all consumers in Slovenia will have the same access regardless of their local DSO. This approach provides sustainability, as this platform is now in normal operation and will continue to be used in the future.

E.ON DEL-DUNANTULI ARAMHALOZATI ZARTKORUEN MUKODO RESZVENYTARSASAG (EDE)

E.ON DEL-DUNANTULI ARAMHALOZATI ZARTKORUEN MUKODO RESZVENYTARSASAG (EDE) launched the so-called flex.on project, one of the main focuses of which was the flexibility platform. Due to the PV proliferation MV and HV/MV, congestions may occur. Instead of CAPEX, DSOs can use flexibility based on OPEX. Potential FSPs are the PVs who cause the congestion. The developed products are: two must-run type and two limit-type ones. The DSO buys the service based on different products. The product concept was formulated in the OneNet project.

The platform uses Flexibility register for the prequalified assets, network calculation module for flexibility needs calculation, market module which is an optimization engine, smart control for activation scheduling, and metering/validation module to create analytics for settlement with the flexibility Service Provider.

The main function of the network calculation module is to generate the network limit list with the necessary parameters, which it passes to the market module. The basis of the calculation is State Estimation.

The module uses not only topological data, but so-called pseudo measurements which have different accuracy and thus affect the final result of the calculation to a different extent, which is due to the WLS method. SE provides a network limit list with the calculated parameters and their standard requirements, and the load flow part of the module provides the sensitivity factors. The load flow is run during each W-1 calculation, as it seemed more economical to run it for the given N-1 states than to consider each N-1 state and store the values in the sensitivity factor matrix.

The Network calculation module uses State Estimation which can increase the accuracy of results if there are additional measurements as inputs. The module furthermore uses the so-called Sensitivity factor, which inherently connected to Market optimization module, it describes the impact of FSP on congestion. The sensitivity factor concept was developed in the OneNet project.

In addition to network calculation and the market module, the Traffic light concept formulated in the OneNet project was used for TSO-DSO coordination.

KYMENLAAKSON SAHKOVERKKO OY (KSOY-V)

Kymenlaakson Sähköverkko Oy will use results from OneNet project to develop DSO's flexibility usage procedure in Finland. At the moment here in Finland, there is not any terms for flexibility usage, which are needed for flexibility procurement. These terms need to be same for every DSO in Finland and that is why this year there will be starting a project to define terms for flexibility usage in Finland.

KSOY-V will also start investigating possibility use case for flexibility uses in our grid. At the moment we haven't become aware of any possible use cases for flexibility in the grid but knowing that PV production and electric vehicle charging are going to be increasing in the grid in the next years, we need to have better understanding of our grid's capabilities. To increase flexibility providers, KSOY-V will start installing next generation of smart meters which will give customers an opportunity to participate to flexibility market via the smart meter.

The concept of TSO-DSO coordination which was demonstrated in OneNet turned out to be viable solutions for handling system usage for flexibility. That is why it is needed to continue the development of coordination platform with the TSO. It is acknowledged that DSO systems needs more development for automated data transfer to the coordination platform.

6 Conclusions

The results presented cover the three main pillars on which OneNet is built: definition of a common market design for Europe, definition of a common IT Architecture and common IT Interfaces and verification of the proposed solutions in large field tests. The results represent a significant step towards a seamless near real time integration of all the actors in the electricity network across countries to optimise the overall energy management while creating an open and fair market structure.

One of OneNet's main results is the OneNet Framework, which provides a middleware and data connector supporting secure and controllable data exchange among grid operators and also other market players. It is a candidate to become a project in Linux Foundation for Energy, which is a strong enabler to it becoming the solution for flexibility market coordination.

The development and testing of the OneNet Framework throughout all the demonstration clusters represents significant achievements in terms of applicability, scalability, and flexibility of the solution, however, these are software components of the broader project transversal project scope. Extensive development work was also conducted within each demonstration work packages - WP7-10, with practical applications and innovative use cases. This comprehensive approach allowed the project partners to develop solutions targeted at their specific needs related with flexibility management, TSO-DSO coordination, and other grid management applications and algorithms, as described in Chapters 3-5. Further to this work, the designing of the regional BUCs empowered many of these solutions to be integrated in a pan-European data exchange mechanisms with the help of the OneNet System, bringing together specific solutions into a unified one.

OneNet's ten field tests have produced several platforms to test the project's grid management use cases. These platforms can be further exploited after OneNet.

OneNet's studies around the common market design resulted in a white paper giving policy recommendations for integrated and coordinated markets.

In OneNet, an open-source approach has been recommended to partners for software results. Taking into account the potential of the OneNet framework, it was decided by the consortium to make the OneNet Framework open-source to further improve its potential to become a widespread solution being used by multiple organization for operational purposes. A permissive license – MIT License – was chosen to be applied to the components, having as exception the ones in which that was not possible to apply due to license compatibility constraints. To that end, an application to the Linux Foundation for Energy was also done, that can maximize the continuity and upscaling of the solution by being supported by an experienced community. LF Energy can significantly support the OneNet project by fostering community collaboration, ensuring open-source development, and providing technical guidance. As part of LF Energy, OneNet may gain increased



visibility, facilitating broader adoption and integration within the energy sector, it also offers a platform for sustainability and scalability, aligning OneNet with global energy transition goals. Connections with regulatory bodies and standardization organizations may also be easier under this initiative, which can help OneNet influence policy and adherence to industry standards.

In addition to the OneNet Framework is open source, some of the platforms produced by the demos have also been made available as open source.

Most of the results are at TRL 7 or 8, indicating that many of the OneNet results are at an advanced stage of development and verification.



References

- [1] Managing Project Results in the Horizon Results Platform, European Commission, <https://webgate.ec.europa.eu/funding-tenders-opportunities/display/IT/Managing+Project+Results+in+the+Horizon+Results+Platform>
- [2] Dissemination and Exploitation in Horizon 2020: H2020 Coordinators' Day, Kirsti Ala-Mutka https://ec.europa.eu/research/participants/data/ref/h2020/other/events/2017-03-01/8_result-dissemination-exploitation.pdf

